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# China Report

## SCIENCE AND TECHNOLOGY

No. 59

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# CHINA REPORT

## SCIENCE AND TECHNOLOGY

No. 59

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PHYSICAL SCIENCES

# ANALYSIS FOR MINOR ISOTOPES DEUTERIUM, OXYGEN-18 IN NATURAL WATERS

Beijing KEXUE TONGBAO [SCIENCE BULLETIN] in English Vol 25 No 3, Mar 80 pp 209-212

[Article by Zhang Qinglian [1728 7230 5571]

[Text]

In the past forty-odd years my colleagues and I have carried out four series of experiments on the distribution of hydrogen and oxygen isotopes in various natural waters, and made corresponding investigations on the methods of analyzing these isotopes.

We started with the examination of the density variation of the water from some snow samples collected in North Europe in December, 1935 and found a depletion of heavier isotopes corresponding to a density difference about $-4.2\,\gamma$, where $\gamma = \mu g/ml$[1]. At the same time we measured the vapor pressure ratio of HDO and $H_2{}^{18}O$ vs. $H_2O$, and established the corresponding formulas for the temperature range from the melting to the boiling point of these isotopic forms of water[2]. These formulas yield a density decrease of $-1.6\,\gamma$ for HDO and $-2.4\,\gamma$ for $H_2{}^{18}O$ at 0°C, the assumed temperature of evaporation of ocean water in cold winter. Thus, the total depletion is calculated to be $-4.0\,\gamma$, a value agreeing reasonably well with observations.

For the separate determination of the density variation due to the content of HDO and $H_2{}^{18}O$ by the float method, we developed a method for the normalization of deuterium by means of laboratory hydrogen sulfide. A comparative measurement on samples and standards eliminated systematic errors.

With data then known on the abundance of deuterium and oxygen-18 in various species of natural water, chiefly snow, rain, land water, ocean water, crystal water of minerals, plant and animal water, we were able to sketch in 1936 the first figure for the cycle of the isotopic forms of water on the earth[3].

In 1958—59, in a survey of the natural waters in China, we collected about 50 samples, which were grouped as waters from sea, river, underground, spring, hot spring, lake, plateau lake, salt lake and oil brine. The result of analysis showed that the waters of salt lake and oil brine were considerably enriched with heavier isotopes[4]. Only a few samples were separately analyzed for deuterium and oxygen-18 after normalization with laboratory carbon dioxide. This known method was bettered

by means of a parallel arrangement for the reference water and the sample to be measured so as to eliminate systematic errors[5].

A third series of measurements were undertaken in our laboratory after we had collected, in 1966 and 1968, ice, snow and water samples in the region north of Mt. Zhumulangma at altitudes from 4.5 to 7 km. Nineteen different samples were grouped as glacial ice, pack snow, river and lake, lake on glacier, soaked ice, and spring water. In all the waters investigated, the contents of deuterium and oxygen-18 were lower than those in standard mean ocean water, SMOW. In general, deuterium was comparatively less depleted in the solid than in the liquid phase. With regard to isotopic altitude effect, age effect, profile isotopic composition and isotopic composition in a plateau lake, the data observed were in conformity with the enviromental factors[6].

In connection with this investigation, we improved the method of normalizing the oxygen isotopes with purified tank oxygen with manganese dioxide as catalyst at 600°C. Oxygen was conducted under pressure through a saturator containing the water sample at 60°C. The gas mixture after the equilibration was chilled with a trap for the recovery of water. The saturator and trap took exactly the same form and could function alternately by suitable adjustment of clamps. Thus, a succeeding procedure could be carried out in the reverse order, and would suffice for a comparative analysis of the sample and the reference water.

On the other hand, we developed in the sixties a temperature-pressure float method, in which a 16 mm spindle-shaped borosilicate glass float was situated in a 2.5 ml chamber with a conical bottom for centering the float. The chamber was closed with a ground glass stopper with capillary tubing to accommodate the expansion of water. The top of the chamber had an upper extension as the body of flotation tube, which after the degassing of the sample would again contain the re-admitted air, that could nevertheless diffuse no more into the chamber during the measurement. With a thermostat constant to $\pm 0.001$°C, an accuracy of $\pm 0.2\gamma$ was readily obtainable.

The fourth series of measurements followed the second ascent from the north slope to the summit of Mt. Zhumulangma in the summer of 1975. Ten samples of snow and ice were collected by the mountaineers at altitudes from 7050 m at the North Col up to the summit, which at an altitude of 8848 m is the pinnacle of the entire earth crust. The locations of these samples are shown in Fig. 1. Five samples from the North Col represented a profile of small depth.

Deuterium was determined with a mass spectrometer of Model M-86, while oxygen-17 as well as -18, with that of Model MAT-CH5. The former instrument was calibrated with hydrogen gas converted from water samples prepared from waters containing $1.05 \pm 0.04$ ppm D and $99.710 \pm 0.013$ atom% D.

Methods for the conversion of water samples into inlet gases of hydrogen and oxygen were worked out[7]. Water was decomposed at 550°C by pure magnesium filings which were previously degassed in high vacuum at about the same temperature, since the metal occluded deuterium at a higher concentration than that in ordinary

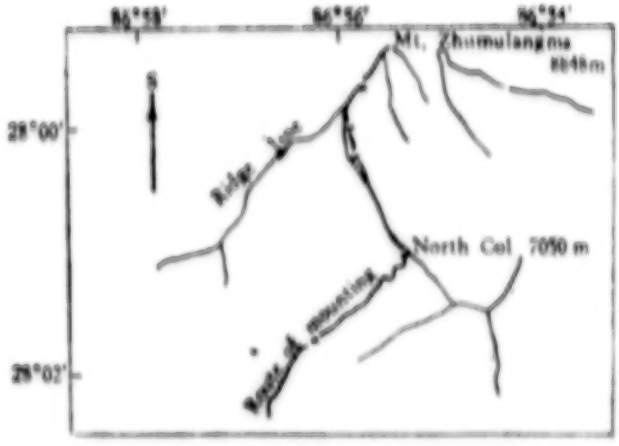


Fig. 1. Four locations of sampling being indicated by the camps from the North Col upward, one between the lowest two of them, and another at the summit.

water. Thus, we could accurately analyze the sample of snow collected from the summit on May 27, 1975, the deuterium content of which was 123.2 ppm, or $\delta D(‰) = -208.8$. These two values, being separately determined, are in conformity with the experimental result of Hagemann et al. for the atomic ratio of D/H in SMOW[12].

The conversion of water sample into inlet oxygen gas was effected by electrolysis on a pure gold anode in 16 ml of a 0.1 *M* sodium fluoride solution at 20°C. Small fractions of oxygen gas, each being produced by a current of 250 mA for 9 min, were collected after removal of water vapor with trap. The first 4 portions were discarded, since they might be contaminated with residual dissolved air, although the cell was filled with nitrogen before the electrolyte was syringed. The following 7 samples were analyzed mass-spectrometrically with an electron emitter made of a pure rhenium strip 0.04 mm thick, 0.7 mm wide and 7 mm long. With an ignition current of 600 μA, it could work for 200 hr[13]. The pressure of oxygen in the ionization chamber was $2 \times 10^{-4}$ torr, while the ion current of mass 32 amounted to $2 \times 10^{-9}$ A. By means of alternate operation on the sample and the standard, and the service of a cup-cup double collector, the masses 32 and 34 were recorded on a compensograph. By the way, we determined the separation factor of $^{18}O$ on gold anode as 1.0076, while the known value in related literature is 1.0094. The mass 33 was measured by readjusting the cup position. After correction was made for the bias of the instrument, the $\delta$ value was obtained from the mass current ratio.

For the summit snow, $\delta^{18}O(‰) = -26.99$, corresponding to the $^{18}O$ content of 1946.5 ppm according to the new determination made by Baertsch for the $^{18}O/^{16}O$ ratio in SMOW[10].

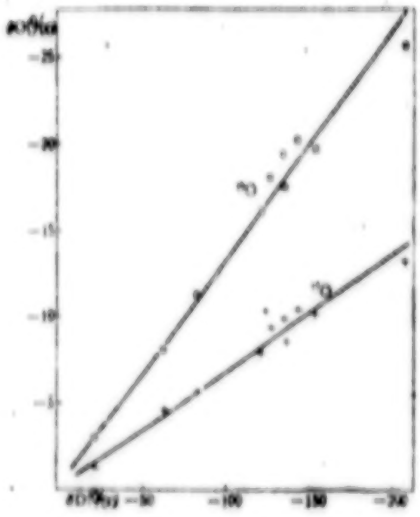

Fig. 2. A plot of $\delta^{17}O$ and $\delta^{18}O$ vs. $\delta D$ of snow and ice at altitudes from 7050 up to 8848 m.

Table 1

$\delta D$, $\delta^{17}O$ and $\delta^{18}O$ of the Snow and Ice at Altitudes From 7 km up to the Summit

| Altitude (m) | Precipitation | Date (1975) | $\delta D$ (‰) | $\delta^{17}O$(‰) | $\delta^{18}O$(‰) |
|---|---|---|---|---|---|
| 8848 | New snow | 27/5 | −208.8 | −13.82 | −26.99 |
| 8600 | Surface snow | ca. 23/5 | −136.2 | − 9.17 | −18.79 |
| 8100 | Granular snow | 20/4 | − 82.2 | − 6.28 | −12.57 |
| 7600 | Ice | ca. 20/4 | − 22.3 | − 1.86 | − 4.31 |
| 7450 | Granular snow | 21/4 | − 62.0 | − 5.25 | − 9.43 |
| 7050 | New snow | 22/3 | −127.7 | − 9.97 | −19.37 |
| 7050 | Old snow | 22/3 | −135.8 | −10.50 | −20.72 |
| 7050 | Granular snow | 22/3 | −144.1 | −11.07 | −21.60 |
| 7050 | Pack snow | 22/3 | −121.7 | − 8.53 | −17.48 |
| 7050 | Ice | 22/3 | −154.7 | −10.83 | −20.99 |

The overall results of analysis are shown in Table 1, where we express the data conventionally as $\delta(‰)$ with SMOW as reference. The corresponding data appearing in a previous article[11] have been re-calculated. One notices that all $\delta$'s were negative. Fig. 2 shows a plot of $\delta^{17}O$ and $\delta^{18}O$ vs. $\delta D$. The following formulas hold approximately:

$$\delta D = 14.5\,\delta^{17}O, \qquad \delta D = 7.0\,\delta^{18}O.$$

Such ratios between $\delta$'s conform with those calculated from the vapor pressure formulas at a temperature about 30°C, which seems to be too high. Furthermore, the maximum depletions observed were about twice as large as those resulting from a single process of evaporation, therefore secondary processes must have occurred.

In recent years we have been interested in preparing some reference samples for deuterium, oxygen-18 and other light isotopes. For example, we possess a reference sample of untreated Beijing University tap water BU76, collected on January 8, 1976. It has a deuterium content of 145.7 ± 0.3 ppm D, and $\delta^{18}O = -9.09‰$. Besides, we collected altogether 12 samples, one each month around the 20th from January to December in the year of 1978. The untreated tap water was analyzed with the MAT-CH5 instrument by the carbon dioxide equilibration method. The oxygen-18 content was found to be constant within an experimental error of ± 0.2‰. For this equilibration method, it is important to determine accurately the exchange equilibrium constant for $^{18}O$ at 25°C, the best value of which known up to date is 1.0412 ± 0.0001, reported by O'Neil et al.[13]. We have checked this value by experiment, and the value we found is 1.0411 ± 0.0002 at 25°C[13].

For the conversion of water samples into inlet gas hydrogen, we obtained good results with the uranium decomposition method devised by Bigeleisen[14]; working with a mass spectrometer of Model MM-602D, we achieved an accuracy of 1‰ for $\delta D$. On the other hand, the $BrF_3$ method of converting water into inlet gas oxygen described by Clayton et al.[15] was tested, and our experimental errors were within 0.2‰ for $\delta^{18}O$.

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CSO: 4020

## CHINA'S FIRST KARST GEOLOGY INSTITUTE ESTABLISHED IN GUILIN

Beijing GUANGMING RIBAO in Chinese 5 Aug 80 p 1

[Article by Wei Zhimin [7614 1807 3046]]

[Text] After 3 years of planning, the building of the Institute of Karst Geology of the Ministry of Geology, China's first national organization specializing in the research of karst topography and located in Guilin City, is almost complete, aside from the museum of karst geology, which is included in the basic construction work.

China is a country rich in limestone-carbonate rocks and has extensive areas of karst topography distribution. According to preliminary statistics, the area of distribution of exposed carbonate rocks reaches 1,200,000 $km^2$, amounting to about one-eighth of the area of the country; if the covered and buried karst areas are included, the total would be more than 2,000,000 $km^2$, about one-fifth of the area of the country. In national economic construction, such as hydroelectric projects, road building and repair, mining and mine construction, industrial, mining, and agricultural water supplies, industrial, civilian, and defense construction projects, etc.; therefore, many complex problems of karst topography are often encountered and in need of resolution. At present, China's research work on karst is still a great distance from satisfying the urgent needs of industrial and agricultural production. For the purpose of strengthening the study of karst geology, the state resolved to build an institute of karst geology in Guilin where the types of karst topography, and their morphology are both typical and complete, for the purpose of "developing studies on the principle of karst development and its utilization and reconstruction." This subject has been listed as one of the key items in the national science and technology development plan outline, 1978-1985. This research institute will emphasize both the basic theoretical study and study on the application of karst. Currently, karst hydrology and karst engineering geology will be the major fields of research, while at the same time studies on some karst caverns and karst mineral deposits will be launched.

With respect to karst theory, studies will be carried out primarily on melting and erosion mechanism and theory, the hydrokinetic zoning theory,

and the effects of geotectonics, geomorphology, and glacier on the development of karst. Although these studies are aimed at the entire country, the emphasis will be on the southern provinces of karst development. In the past 3 years, while the institute was being constructed, in connection with the key subjects of the national science and technology development plan outline, the major subjects of study have included: the principle of karst development in Guilin-Yangsu and its hydrology and engineering geology, a study on the environmental geology and protection of water resources of Guilin City, principle of development of karst in Luota of Hunan Province, and its utilization and reconstruction, a study on the application of remote sensing technology in karst geology research, etc. Preliminary results have been obtained in all these subjects.

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Front Cover: Melting Phenomenon of Glacier (See P 45, An Illustrated Book, CHINESE GLACIERS Introduced

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Inside Back Cover: Ideal Semiconductors--Field Effect Transistor and MOS Integrated Circuits

Back Cover: The BZ3 Standard Resistor, Honorable Winner of State's Silver Medal

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CSO: 4008

AUTHOR: WANG Peilun [3769 0160 4858]

ORG.: None

TITLE: "Robustness of Kinescope Glass Shell"

SOURCE: Nanjing NANJING GONGXUEYUAN XUEBAO [JOURNAL OF NANJING INSTITUTE OF TECHNOLOGY] in Chinese No 2, 1980 pp 1-13

TEXT OF ENGLISH ABSTRACT: The problem of robustness of the kinescope glass shell is discussed in detail in this paper. First, the main causes of explosion of the glass shell are analyzed. The author points out that the robustness of the glass shell depends on the distribution of residual stress and that of the structural stress in the shell. Experimental methods for determining the residual stress and structural stress in the glass shell are described. The problem of stress concentration caused by the air bubble in the shell is discussed. A tentative idea of how to use the method of fracture mechanics to study the effect of macroscopic defects of the glass shell is proposed. Finally, the principles of design for preventing explosion of the kinescope glass shell are presented.

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TITLE: "An Experimental Study of ZDB-150 Type Cryogenic Vacuum Pump with Closed-Cycle Refrigerator"

SOURCE: Nanjing NANJING GONGXUEYUAN XUEBAO [JOURNAL OF NANJING INSTITUTE OF TECHNOLOGY] in Chinese No 2, 1980 pp 14-22

TEXT OF ENGLISH ABSTRACT: Cryogenic pumping represents the latest method in high and ultra-high vacuum-obtaining techniques. It has the advantages of high pumping speed, freedom from hydrocarbon contamination, and adaptability to a wide range of operating pressures. This paper deals with the design concepts, the actual construction and the main performances of ZDB-150 type cyropump. In the free molecule flow region the pumping speed is greater than 650 l/sec and 1400 l/sec for air and hydrogen respectively. The ultimate pressure is less than $6 \times 10^{-10}$ torr. The two-stage G-M closed-cycle refrigerator provides 2.5 watts at 12 K for the second stage and 25 watts at 70 K for the first stage. A comparison between the performances of the ZDB-150 cryopump and some other commercial types is listed at the end of this paper.

AUTHOR: HUANG Qiwen [7806 0679 2429]
ZHANG Mingbao [1728 2494 1405]
WANG Zongjing [1769 1350 2417]

ORG: None

TITLE: "Investigation of a Long-Life $CO_2$ Laser with $CaCO_3$ as Supplier"

SOURCE: Nanjing NANJING GONGXUEYUAN XUEBAO [JOURNAL OF NANJING INSTITUTE OF TECHNOLOGY] in Chinese No 2, 1980 pp 23-28

TEXT OF ENGLISH ABSTRACT: This paper describes the problem of using $CaCO_3$ as a supplier of $CO_2$ to compensate for its loss by dissociation and thereby to prolong the lifetime of a $CO_2$ laser. The relation between the equilibrium pressure of $CaCO_3$ and the laser output characteristics is also investigated.

AUTHOR: SHA Yujun [1097 3768 6874]

ORG: None

TITLE: "A General Analytic Method of Solving Mixed Lumped-Distributed Networks"

SOURCE: Nanjing NANJING GONGXUEYUAN XUEBAO [JOURNAL OF NANJING INSTITUTE OF TECHNOLOGY] in Chinese No 2, 1980 pp 29-42

TEXT OF ENGLISH ABSTRACT: In this paper the uniform transmission line is considered as a four-terminal element, and the formula for its Y-parameters against the external circuit is derived. Using these parameters the author suggests a general analytic method of solving the mixed lumped-distributed networks, and a transmission-line transformer is taken as an example of its application. The result thus obtained gives a theoretical explanation of the wideband characteristic of the transmission-line transformer.

AUTHOR: YING Jimin [2019 3444 3046]

ORG: None

TITLE: "A New Approach to the Helix Dispersion Equation for Longitudinal Loading by Radial Vanes"

SOURCE: Nanjing NANJING GONGXUEYUAN XUEBAO [JOURNAL OF NANJING INSTITUTE OF TECHNOLOGY] in Chinese No 2, 1980 pp 43-56

TEXT OF ENGLISH ABSTRACT: This paper gives a new approach to derive the helix dispersion equation for longitudinal loading by radial vanes and also gives the helix dispersion equations for two specific loading structures. The calculated values by this method agree satisfactorily with the experimental results.

AUTHOR: FENG Chunbo [7458 4783 0130]

ORG: None

TITLE: "A Computational Method for Stability Analysis of Linear Control Systems"

SOURCE: Nanjing NANJING GONGXUEYUAN XUEBAO [JOURNAL OF NANJING INSTITUTE OF TECHNOLOGY] in Chinese No 2, 1980 pp 57-61

TEXT OF ENGLISH ABSTRACT: A computational method for stability analysis of linear control systems is presented. The state-variable matrix of a linear system is first transformed into an equivalent upper Hessenberg matrix. This reduction of the system matrix to the Hessenberg form may be achieved by the use of either stabilized elementary matrices or elementary unitary matrices. The upper Hessenberg matrix is then transformed into a Schwarz matrix. The stability of the system is analyzed on the basis of the well-known property of the Schwarz matrix. The suggested method is also useful for computer-aided feedback synthesis of multivariable linear control systems.

AUTHOR: SHI Mingheng [2457 2494 1854]

ORG: None

TITLE: "Differential Equations of Intense Heat and Mass Transfer in Capillary-Porous Medium"

SOURCE: Nanjing NANJING GONGXUEYUAN XUEBAO [JOURNAL OF NANJING INSTITUTE OF TECHNOLOGY] in Chinese No 2, 1980 pp 62-68

TEXT OF ENGLISH ABSTRACT: The study of heat and mass transfer in capillary-porous medium is extended to the case where liquid and vapor are transferred simultaneously. A system of differential equations is set up for this case.

AUTHOR: YIN Kaitai [3009 7030 3141]
WANG Zhong [3069 1813]

ORG: None

TITLE: "Design and Operation of Submerged-Combustion Evaporator"

SOURCE: Nanjing NANJING GONGXUEYUAN XUEBAO [JOURNAL OF NANJING INSTITUTE OF TECHNOLOGY] in Chinese No 2, 1980 pp 69-79

TEXT OF ENGLISH ABSTRACT: This paper is a summary of the design and operation of a submerged-combustion evaporator. This technique can attain three aims: to recover the spent hydrogen to be used as fuel for evaporation; to raise the concentration of NaOH liquor; and to recover the exhaust gas, which is relatively pure nitrogen, to be used as protective gas. This useful technique has not been widely adopted in our country because of the lack of safety measures.

In this paper the condition of stability of the submerged combustion and the factors causing explosion are analyzed. A design principle to reduce the pressure fluctuation and some safety measures against explosion are proposed.

AUTHOR: SONG Yatong [1345 7161 2717]

ORG: None

TITLE: "Research on Artificially Generated Earthquake Records"

SOURCE: Nanjing NANJING GONGXUEYUAN XUEBAO [JOURNAL OF NANJING INSTITUTE OF TECHNOLOGY] in Chinese No 2, 1980 pp 80-89

TEXT OF ENGLISH ABSTRACT: In this paper, a survey is made of the research works on artificially generated earthquake records. For structural design purposes, the author proposes a method of creating artificial earthquake acceleration-time records which are compatible with a given smooth design spectrum, and develops a corresponding computer program. This presupposes that the ground motion in an earthquake consists of a linear combination of various harmonic motions with stochastic phase angles. The amplitudes of the Fourier spectrum are then modified step-by-step until the amplitudes of the response spectrum of the artificially generated earthquake record match the given design spectrum most closely. The resulting artificial time records are representative of the given earthquake intensity and design spectrum, and will provide a reliable basis for the aseismic design of important engineering structures.

AUTHOR: DING Dajun [0002 1129 6874]

ORG: None

TITLE: "Discussions on Some Problems in the Design of Masonry Structures"

SOURCE: Nanjing NANJING GONGXUEYUAN XUEBAO [JOURNAL OF NANJING INSTITUTE OF TECHNOLOGY] in Chinese No 2, 1980 pp 90-104

TEXT OF ENGLISH ABSTRACT: In this paper, the author gives his own opinions on several problems in the Design Code of Masonry Structures GBJ 3-73.

For the influence coefficient of eccentricity (eccentricity coefficient), the author endeavors to offer some theoretical explanations and makes an investigation into the possibility of improvement. For the computational height (effective length) of a wall supported on four sides, he suggests a set of three consistent formulas. For the calculation of bearing (on partial area), he gives some practical proposals based on recent test results in this country.

AUTHOR: WU Mingwei [0702 2494 0251]

ORG: None

TITLE: "On the Layout of Urban Industry"

SOURCE: Nanjing NANJING GONGXUEYUAN XUEBAO [JOURNAL OF NANJING INSTITUTE OF TECHNOLOGY] in Chinese No 2, 1980 pp 105-112

TEXT OF ENGLISH ABSTRACT: Based on a survey of the present status of our city-planning practice, the author gives a preliminary summary of the problems concerning the overall arrangement of urban industry in our country. The article consists of four parts: the structure of urban industry, the types of distribution of industries, the organization of the industrial district and the layout of the small local industries.

The author advances some views on the relationship between the economic arrangement and urban planning, and the relationship between the structure and layout of industries. The method of organizing the industrial district, the correct attitude toward the small industries and their layout are also discussed.

AUTHOR: GAN Cheng [1927 2906]

ORG: None

TITLE: "How to Improve the Thermal Stability of the Light Exterior-Protected Construction of an Air Conditioned Room"

SOURCE: Nanjing NANJING GONGXUEYUAN XUEBAO [JOURNAL OF NANJING INSTITUTE OF TECHNOLOGY] in Chinese No 2, 1980 pp 113-120

TEXT OF ENGLISH ABSTRACT: This paper shows that it is incorrect to specify the thermal stability of an exterior-protected construction by its index of thermal inertia, and that the thermal stability rather depends upon its decrement factor and characteristic time. The means of improving the thermal stability of a light exterior-protected construction of an air conditioned room are pointed out.

9717
CSO: 4009

AUTHOR: LU Qiang [4151 1730]
WANG Zongzhong [3769 0112 7703]
HAN Yingduo [7281 5391 6995]

ORG: All of the Department of Electric Power Engineering, Qinghua University

TITLE: "The Optimal Fast Turbine Valve Control and Its Experimental Research on Micro-Alternator System"

SOURCE: Beijing ZHONGGUO KEXUE [SCIENTIA SINICA] in English Vol 23 No 7, Jul 80, p 923

TEXT OF ENGLISH ABSTRACT: This paper suggests a plan of optimal fast turbine valve closed-loop control for large turbo-generator in long-distance transmission system. It is proved, not only from theoretical analysis and calculations but also through experiments on a micro-alternator system, that the fast turbine valve controller designed according to the linear optimal control theory can markedly increase the transient stability limit of the transmission system under temporary or permanent fault conditions and greatly improve the dynamic quality during the post fault period. An important characteristic of the

[Continuation of ZHONGGUO KEXUE Vol 23 No 7, Jul 80]

suggested control plan is that it can adjust itself to distinguish and suit the changes of different fault conditions, which can hardly be obtained by the fixed logical open-loop control plan.

AUTHOR: GUAN Dexiang [7070 1795 4161]
LI Yinting [2621 5593 0080]
XUE En [5641 1869]

ORG: GUAN and LI both of the Institute of Mechanics, Chinese Academy of Sciences; XUE of the Institute of Geology, Chinese Academy of Sciences

TITLE: "A Fluid-Dynamic Model of the Ascending Flow in the Mantle Plume"

SOURCE: Beijing ZHONGGUO KEXUE [SCIENTIA SINICA] in English Vol 22 No 9, Sep 79 p 1070

TEXT OF ENGLISH ABSTRACT: It is of significance, both for the exploitation of geothermal resources and for an understanding of the causes of volcanic and seismic activities and the continental drift, to make a thorough study of the ascending flows in the mantle plumes that lie beneath the hot spots of the earth. In this paper, a fluid-dynamic model of this ascending flow is presented. The extent of the mantle plume, the maximum temperature difference and the maximum velocity of the ascending flow in the mantle plume, and the heat transported by the mantle plume to the lithosphere have all been estimated. The results are found to be in good accord with the available data from geophysical observations.

9717
CSO: 4009

AUTHOR: KU Huan [2688 3883]

ORG: None

TITLE: "Abundance of Flowers and Giant Fruits of Environmental Research"

SOURCE: Beijing HUANJING BAOHU [ENVIRONMENTAL PROTECTION] in Chinese No 2, 80 pp 1-2

ABSTRACT: If problems of environmental pollution are not resolved or not resolved well, the progress of socialist construction will be affected, China's reputation will be affected, and the people's health will be damaged. In 1972, the Chinese Academy of Sciences began to organize scientists of various fields to participate in scientific research for environmental protection. Since then, 20 first prizes and 2 second prizes have been awarded by the National Science Conference, and 12 important fruits of science and technology prizes awarded by Chinese Academy of Sciences with respect to regional environmental surveys and studies on environmental quality. The paper reviews various advances in studies on the accumulation, conversion, metabolism, and decomposition of mercury, cadmium, lead, zinc, and agricultural drug contamination, the effective use of activated charcoal, catalysis, membrane technique, extraction separation, and microbiological methods of direct elimination of sources of pollution, and aspects of effects of environmental pollution on human health, in these years, especially since 1977.

AUTHOR: QU Geping [2575 2706 1627]

ORG: None

TITLE: "Industrial Production and Environmental Protection (I)"

SOURCE: Beijing HUANJING BAOHU [ENVIRONMENTAL PROTECTION] in Chinese No 2, 80 pp 3-6, 2

ABSTRACT: Environmental protection is one of the important contents of socialist modernization. A society cannot be modernized if it is not clean and beautiful. In the first segment of the paper, a global strategy of environmental protection evolved from the Stockholm Conference of 1972 is discussed. In the second segment, the paper discusses the condition of China's environment, including paragraphs on air pollution, water pollution, industrial solid waste, destruction of natural environment, destruction of grasslands. This paper is the first part of a reprint of a report delivered by the author at the Beijing Symposium of Industrial Economy and Industrial Management in Dec 79, with some abbreviation.

AUTHOR: GUO Zuyuan [6665 4371 3293]

ORG: None

TITLE: "Do a Good Job of Economic and Technical Assessment of the Environment"

SOURCE: Beijing HUANJING BAOHU [ENVIRONMENTAL PROTECTION] in Chinese No 2, 80 pp 7-8

ABSTRACT: Mankind's activities of developing production and improving livelihood are limited by the natural environment on the one hand and are causing changes of the natural environment on the other. An assessment of the quality of the natural environment at a factory or a water system is for the purpose of protecting the environment, with the development of production, improvement of livelihood, and contributing to the welfare of the people as the final goal. Assessment for the purpose of assessment just will never do. The evaluation must be of the entire environment, including, aside from the natural environment, the social and political environment as well. The economy is the foundation of politics and the key to scientific and technological development, and the basis for cultural environment as well. In the past, the concept of environmental assessment was limited to natural or ecological evaluation. An account of the damages of 3 wastes was made, but not the material and energy contents of the 3 wastes. There was only an account of cost estimate for treatment and control, but not the benefits. This paper points out the various economic benefits of environmental protection measures.

AUTHOR: None

ORG: Suzhou Municipal Bureau of Environmental Protection

TITLE: "Charging Pollution Fees is an Important Measure of Environmental Management"

SOURCE: Beijing HUANJING BAOHU [ENVIRONMENTAL PROTECTION] in Chinese No 2, 80 pp 8-10

ABSTRACT: Suzhou, the traditional heaven, is now having serious problems of environmental pollution. The masses are aware of the damages on them and are violently demanding control measures. Beginning in Sep 79, the bureau has practiced a system of charging pollution fees from 15 factories. The method has had positive effects on environmental protection. This paper describes the details of the system currently in effect in Suzhou City.

AUTHOR: JIN Jianming [6855 7003 2494]
ZHANG Weishen [1728 4850]

ORG: None

TITLE: "Protecting Natural Environment and Natural Resources--Understandings From Learning Methods of Environmental Protection"

SOURCE: Beijing HUANJING BAOHU [ENVIRONMENTAL PROTECTION] in Chinese No 2, 80 p 13-15

ABSTRACT: The Chinese People's Republic Environmental Protection Law (Trial Implementation) enacted in Sep 79 delineated rules of environmental protection work and activity in China. The law is a realization of the wishes and outcries of all the people of the country and marks a new historical era in China. This paper is an attempt to interpret the contents and goals of that law.

AUTHOR: YUAN Dechang [5913 1795 2490]
LIU Yunxi [0491 0061 0823]
WU Jiangjin [2976 3068 3160]

ORG: None

TITLE: "Ion Exchange Method of Extracting Silver From the Water of Image-Fixing Bath"

SOURCE: Beijing HUANJING BAOHU [ENVIRONMENTAL PROTECTION] in Chinese No 2, 80 pp 16-17

ABSTRACT: The water of the image-fixing process of motion picture film contains 1-50mg/liter of silver, far exceeding the limit of 0.1-0.5mg/l set by the state. Reclaiming the silver from the waste water is not only economically worthwhile, but may also reduce the heavy metal burden of the waterways. This paper describes, step by step, an experiment on the use of ion exchange resin absorption and sodium dithionate reduction techniques to extract and reclaim the silver content.

AUTHOR: ZHANG Shuyi [1728 2579 0030]

ORG: None

TITLE: "A New Procedure of Closed Cycling of White Liquid Waste of the Paper Making Process"

SOURCE: Beijing HUANJING BAOHU [ENVIRONMENTAL PROTECTION] in Chinese No 2, 80 pp 18-20

ABSTRACT: Tianjin Paper Mill uses primarily Phragmites communis Trin. as the raw material, steamed in magnesium hydrogen sulfite, and bleached with calcium chlorate to produce paper. A large quantity of water is consumed in the production processes. In the past, the plant discharged 50,000 $m^3$ of liquid waste to create serious pollution problem for Haihe, which is the source of drinking water for the city, and the nearby Bohai Bay. An analysis of the quantity and the content of the liquid waste indicates that it is divided into 3 types: the black cooking waste, the bleaching waste, and the waste of the paper-making machine. The last type, the white liquid, amounts to 30 percent of the total quantity, and has a relatively simpler content. A technique has been adopted by the mill to use a flocculant to cycle the white liquid before reusing it in the paper-making machine. This technique of closed cycling is reported.

AUTHOR: ZHANG Jian [1728 6904]

ORG: None

TITLE: "A New Waste Water Treatment Method"

SOURCE: Beijing HUANJING BAOHU [ENVIRONMENTAL PROTECTION] in Chinese No 2, 80 pp 21-22

ABSTRACT: The PSB method (photosynthesis bacteria) is a method of treating harmful organic matter and deoxidizing waste water. After treatment, the residual bacteria have high nutritional value. This type of photosynthesis bacteria, a red colored sulfur-free bacteria, was discovered by a professor of West Germany in a city waste water treatment plant. After treatment the bacteria are suitable as feed for animals and the culture fluid may be used directly as organic fertilizer. This bacteria, the needed industrial installation, and the work procedure are described.

AUTHOR: MA Yuqin [7456 3768 3830]

ORG: None

TITLE: "Radioactive Level of Phosphorus Fertiliser and Its Effect on Water"

SOURCE: Beijing HUANJING BAOHU [ENVIRONMENTAL PROTECTION] in Chinese No 2, 80 pp 23-25

ABSTRACT: The phosphorus fertilisers used in China are mainly calcium perphosphate, processed from apatite, which is mostly accompanied with trace quantities of natural radioactive elements, mainly uranium, with some thorium and radium, which become part of the phosphorus fertilizer. Experimental data indicate that the uranium content of the fertilizer varies between 0.1) $\mu$ g - 170$\mu$ g/g, the thorium content 1.1-12.0 $\mu$g/g, while the radium content is relatively minor. Due to loss of phosphorus fertiliser , water of nearby streams may have a high concentration of phosphorus as well as uranium. This paper reports the u, Th, and Ra contents of Zhangjiakou, Loyang, and Zhanjiang region phosphorus fertilisers being sold in the markets and contents of P,U in 4 nearby streams. Spalding's report of a study on the subject in Mexico Bay is quoted for comparison.

AUTHOR: HE Shiqun [6320 0013 5028]

ORG: None

TITLE: "Irradiation Method of Eliminating Environmental Pollutants"

SOURCE: Beijing HUANJING BAOHU [ENVIRONMENTAL PROTECTION] in Chinese No 2, 80 pp 25-26

ABSTRACT: Irradiation method is the use of $\gamma$ ray, x ray, electron ray to treat materials to cause them to change their original characteristics and reach the predetermined objective. Applications of irradiation in environmental protection include rejuvenating the activated charcoal after it has been used to treat liquid waste of the textile industry, manufacturing ozone, disinfecting waste of domestic fowls, urban sludge, etc. Irradiation may also break down the residual organic phosphorus and organic chlorine, etc. The high energy electron accelerator installed by Boston's waste water treatment plant in 1975 is mentioned as an example. The cost of such facilities is discussed along with the work principle and procedure.

AUTHOR: TANG Yijian [0781 0110 0494]

ORG: None

TITLE: "Migration and Conversion of Heavy Metal Elements in Bodies of Water"

SOURCE: Beijing HUANJING BAOHU [ENVIRONMENTAL PROTECTION] in Chinese No 2, 80 pp 33-35, 41

ABSTRACT: Many heavy metals are known to be environmental pollutants, but in the complex natural environment, states of metals change yet they cannot be biodegraded; therefore, they can be easily concentrated in organisms. In bodies of water, although the solubility of metals is low, the complexing ability is very high. They can easily be attached to organic or inorganic colloids. Some heavy metals may also leave the water and disperse into the atmosphere. This paper attempts to discuss the following problems: (1) In what direction do heavy metals migrate? (2) How do they migrate? (3) What changes are occurring in the process of migration? (4) Are this type of migration and conversion harmful or beneficial to the human environment? The purpose of the discussion is to dispel certain blind optimism concerning the subject matter.

AUTHOR: PAN Yunzhou [3382 0061 5297]

ORG: None

TITLE: "Preventing the Tragedy of Minamata Disease to Reappear On the Banks of Songhuajiang"

SOURCE: Beijing HUANJING BAOHU [ENVIRONMENTAL PROTECTION] in Chinese No 2, 80 pp 40-41

ABSTRACT: The problem of pollution in Songhuajiang has grown to be more and more serious since 1958. In the 300 km section of the river below Kirin City, fish can basically no longer be observed. The leftover fish, containing methyl mercury far exceeding the limit of 0.3mg/kg standard set in China is definitely harmful to humans. Signs of Minamata disease have already appeared on the banks of Songhuajiang. The close to 100 tons of mercury discharged into the river in the past 2 decades has mostly settled to the bottom of the river to release methyl mercury into the water continuously, while the sediments are continuously being moved down stream during every flood season. This paper seeks to bring the situation to public attention. A 7-point proposal to protect the water system and to prevent further development of the Minamata Disease tragedy is included.

6248
CSO: 4009

AUTHOR: XIANG Zhongyong [7309 6988 1661]

ORG: None

TITLE: "Analysis of the Staggered Parallel Blasting in Hot Stoves"

SOURCE: Beijing GANGTIE [IRON AND STEEL] in Chinese No 1, Jan 80 pp 1-8

TEXT OF ENGLISH ABSTRACT: The increase of hot blast temperatures by means of staggered parallel blasting in hot stoves is discussed.

Through a simulated study, it has been theoretically proved that two stoves staggered parallel on blast have a higher thermal efficiency that does a single stove on blast. The thermal load is also higher than that of a single stove and the dome temperature is lower. The fundamental concepts relating to a high temperature blasting operation are described.

The amount of heat required for the next blast cycle and the time available to get optimum results are calculated with the aid of a computer. The gas/air ratio and their individual flows are controlled vor effective combustion in the hot stove in the staggered parallel blasting model. The staggered parallel

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blasting model is used to control the hot blast temperature. The computer controls the volume distribution between the stoves on blast by directly controlling the cold blast regulating valves.

AUTHOR: CAI Zhipeng [5591 1807 7720]
XIE Yunheng [6200 5940 3932]
XIA Anwu [1115 1344 2976]

ORG: None

TITLE: "The Interaction of Supersonic Jet on Liquid Bath in Oxygen Steelmaking"

SOURCE: Beijing GANGTIE [IRON AND STEEL] in Chinese No 1, Jan 80 pp 14-19

TEXT OF ENGLISH ABSTRACT: This paper summarizes the results obtained from experimental model studies on the behavior of supersonic oxygen jet in top-blown steelmaking converters, especially the interaction of the jet on the liquid bath. Laboratory experiments are performed in accordance with the similarity theory. Representative results, such as axial velocity decay and lateral velocity distribution of the supersonic oxygen jet as well as its penetration depth and impact area on the liquid bath have been obtained. Mathematical models have been established from these results for scale-up to commercial furnaces. A large number of experimental heats on a hot model were carried out in combination with a study on possible reduction of smelting time on a five-ton converter at the Capital Iron and Steel Company in Beijing. The results

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proved that an average oxygen blowing time per heat may be reduced from 14 minutes to 12 minutes under otherwise equal conditions.

AUTHOR: LI Zhengbang [2621 2973 6721]
ZHOU Wenhui [0719 2429 6540]
LI Yida [2621 6146 1129]

ORG: None

TITLE: "Mechanism of Removal of Non-Metallic Inclusions in the ESR Process"

SOURCE: Beijing GANGTIE [IRON AND STEEL] in Chinese No 1, Jan 80 pp 20-26

TEXT OF ENGLISH ABSTRACT: ESR is one of the most effective means of removing non-metallic inclusions from steel. Much controversy exists regarding the mechanism of slag removal in the ESR process.

The ESR process consists of three stages: 1) Formation of droplets on the electrode tip; 2) Droplets falling through the slag; 3) Collection of the metal in a pool at the top of the ingot.

In order to find out which is the main step in the refining process, samples are taken from the solid electrode, the molten film on the electrode tip, metal droplets in the slag layer and the final ingot, and quantitative determination of inclusions made by metallographic, chemical and radioisotopic (indicator $Zr^{95}O_2$) methods.

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From the results obtained it is concluded that the removal of non-metallic inclusions occurred mainly at the electrode tip. Results of experiments on industrial furnaces have confirmed this conclusion.

AUTHOR: HE Chongzhi [0149 1504 2535]
MENG Qing'en [1322 1987 1869]
ZHAO Yingwei [6392 3841 0251]

ORG: None

TITLE: "X-Ray Analysis of the Aging Process in 18 Ni Maraging Steels"

SOURCE: Beijing GANGTIE [IRON AND STEEL] in Chinese No 1, Jan 80 pp 27-34

TEXT OF ENGLISH ABSTRACT: 18 Ni maraging steel possesses relatively high strength and toughness. In this study the substructure, reversely transformed austenite and regularities of changes in lattice parameters during aging are determined by X-ray diffraction. It is shown that after aging treatment at various temperatures below 520°C for three hours martensite matrix has stability of fine substructure and reversely transformed austenite dispersively precipitates at 480°C. The appearance and disappearance of this austenite are accompanied by the growth and refinement of the substructure. These structure parameters explain regularities of changes in mechanical properties and serve as reference data for selection of heat treatment and softening regimes.

AUTHOR: LUO Ligeng [5012 0500 2577]
CAI Qigong [5591 0366 7255]
SHEN Huiwang [3747 6540 2489]
WANG Degen [3076 1795 2704]

ORG: None

TITLE: "The Determination of the Plane Strain J-Integral Crack Extension Resistance Curve"

SOURCE: Beijing GANGTIE [IRON AND STEEL] in Chinese No 1, Jan 80 pp 35-41

TEXT OF ENGLISH ABSTRACT: In the present paper the plastic part of the J-integral was derived based on the model of pure power hardening materials. The new expression found was $J_p = -\frac{U_p}{B}\left(\frac{1}{P}\frac{\partial P}{\partial a}\right)_\Delta$. An attempt was also made to elucidate the theoretical basis and the approximity nature of the expression in current use $J_p = \frac{2U_p}{B(w-a)}$. This latter expression could be arrived at by assuming $\left(\frac{1}{P}\frac{\partial P}{\partial a}\right)_\Delta \simeq \left(\frac{1}{P_L}\frac{\partial P_L}{\partial a}\right)$ and substituting it in the new expression. In this paper J-integral curves of four kinds of materials were quoted from our

[Continuation of GANGTIE No 1, Jan 80 pp 35-41]

laboratory. It was found from the curves that: (1) within quite a wide range of the specimen sizes the plane strain resistance curve seems to be an inherent characteristic of the materials; (2) to the composition, heat treatment and microstructure of the materials tested, the crack initiation toughness is not as sensitive as the resistance curve; (3) for predicting $K_{Ic}$ of a large specimen with the aid of the resistance curve, different points thereon should be used for the two types of materials. For one type, $K_{Ic}$ is related to the highest point (saturation point), for the other type to the initial point of the resistance curve.

AUTHOR: LIANG Guoping [2733 0948 1627]

ORG: None

TITLE: "The Optimum Distribution of Loads on Rolling Mills"

SOURCE: Beijing GANGTIE [IRON AND STEEL] in Chinese No 1, Jan 80 pp 42-48

TEXT OF ENGLISH ABSTRACT: Methods of load distribution used in our country and abroad are reviewed from the view of technological requirements and mathematics, and tandem mills are taken as examples. Based on summary and analysis of many distribution methods used in plants, a concept about load function is proposed. In addition, the optimality of "equal load" distribution is proved. A regime of optimum load distribution and its calculation are given.

AUTHOR: YANG Fachang [2799 4099 2940]
ZHU Yuzhou [2612 1342 1352]

ORG: None

TITLE: "Eccentricity of Wheels in Hot Rolling"

SOURCE: Beijing GANGTIE [IRON AND STEEL] in Chinese No 1, Jan 80 pp 49-58

TEXT OF ENGLISH ABSTRACT: There is always eccentricity in pressed and rolled wheels, which adversely affects their use, service life and cost. There are many points of view about eccentricity of wheels. According to the production technology of wheels, we have analyzed blanks for wheels worked after every operation under the same conditions. The analysis shows that in blanks formed on 8000 t hydraulic press there are two different centers for inside and outside hubs. After rolling the blanks have three centers, two for inside and outside hubs and one for internal diameter of inside and outside rims. After coning wheels with four centers are obtained, i.e., two centers for inside and outside hubs and two centers for inside and outside rims.

The authors came to the conclusion that it is important and necessary to control the atmosphere in the heating furnace, to remove the scale by high pressure

[Continuation of GANGTIE No 1, Jan 80 pp 49-58]

water, to improve the structure and hydraulic system of the platform for the hydraulic press and to improve the impressing mechanism of 3000 t hydraulic press as well.

AUTHOR: WEI Zhenyu [7614 2182 1342]

ORG: None

TITLE: "On the Metallurgical Problems of Some Precipitation Hardening Stainless Steels"

SOURCE: Beijing GANGTIE [IRON AND STEEL] in Chinese No 1, Jan 80 pp 59-64

TEXT OF ENGLISH ABSTRACT: Though precipitation hardening ultra high strength stainless steels have been developed for decades, the development of space science, modern defense and some important civil applications stimulates new grades to appear successively. The history, present status and outlook of precipitation hardening ultra high strength stainless steels are briefly described. Works about the influence of metallurgical factors, especially physical metallurgy, on the properties of this type of steel abroad are reviewed. Maraging stainless steels developed since the 60's and means of improving their toughness are emphasized. Considerations about the development of new grades of precipitation hardening ultra high strength stainless steels are proposed.

9717
CSO: 4009

AUTHOR: ZOU Chengzu [6760 2110 4371]

ORG: Department of Mathematics, the Mathematics Institute, Jilin University

TITLE: "A Class of Operators and the Spectral Theory (II)--The Restriction and Quotient of (AC) Operator"

SOURCE: Jilin JILIN DAXUE ZIRAN KEXUE XUEBAO [NATURAL SCIENCE JOURNAL OF JILIN UNIVERSITY] in Chinese No 1, 1980 pp 1-9

TEXT OF ENGLISH ABSTRACT: This paper is a continuation of a previous paper. We investigated the heredity of (AC) operator which is on a spectral maximal space. We have proved that: (1) If $T \in \mathfrak{B}(\mathfrak{X})$ is (AC) operator, and $\mathfrak{Y}$ is a spectral maximal space, then the restriction $T_{\mathfrak{Y}} \in \mathfrak{B}(\mathfrak{Y})$ of T on $\mathfrak{Y}$ and the quotient operator $T^{\mathfrak{Y}} \in \mathfrak{B}(\mathfrak{X}/\mathfrak{Y})$ induced by T on $\mathfrak{X}/\mathfrak{Y}$ is the (AC) operator. (2) If $T \in \mathfrak{B}(\mathfrak{X})$ is a decomposable operator, and $\mathfrak{Y}$ is a spectral maximal space, the quotient operator $T^{\mathfrak{Y}} \in \mathfrak{B}(\mathfrak{X}/\mathfrak{Y})$ induced by T on the quotient space $\mathfrak{X}/\mathfrak{Y}$ is a decomposable operator. This is a positive answer to the open question of I. Colojoara and C. Foias.

AUTHOR: WANG Junyu [3769 0193 4416]

ORG: Department of Mathematics

TITLE: "The Semigroup Approach to Cauchy Problem for the System of Gas Dynamics with a Viscosity Term"

SOURCE: Jilin JILIN DAXUE ZIRAN KEXUE XUEBAO [NATURAL SCIENCE JOURNAL OF JILIN UNIVERSITY] in Chinese No 1, 1980 pp 10-18

TEXT OF ENGLISH ABSTRACT: In this paper we consider the Cauchy problem for the system of gas dynamics with a viscosity term $u_t + [p(v)]_x = \mu u_{xx}$, $v_t - u_x = 0$. By means of the theory of nonlinear semigroups, we have proved the existence and uniqueness of the generalized solution of this problem. It follows from the Sobolev imbedding theorems that the generalized solution is in fact a classical solution provided the initial data and the function $p(v)$ are of appropriate smoothness.

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TITLE: "On the Nonlinear Boundary Problems for Quasilinear Elliptic and Parabolic Equations"

SOURCE: Jilin JILIN DAXUE ZIRAN KEXUE XUEBAO [NATURAL SCIENCE JOURNAL OF JILIN UNIVERSITY] in Chinese No 1, 1980 pp 19-46

TEXT OF ENGLISH ABSTRACT: In this paper, the nonlinear boundary value problems

$$\sum_{j=1}^{N} d_j(x) \frac{\partial u}{\partial x_j} = \varphi(x,u)$$

are considered for quasilinear elliptic and parabolic equations

$$\sum_{i,j=1}^{N} a_{ij}(x) \frac{\partial^2 u}{\partial x_i \partial x_j} + f\left(x,u, \frac{\partial u}{\partial x_1}, \ldots, \frac{\partial u}{\partial x_N}\right) = 0,$$

$$\sum_{i,j=1}^{N} a_{ij}(x,t) \frac{\partial^2 u}{\partial x_i \partial x_j} + f\left(x,t,u, \frac{\partial u}{\partial x_1}, \ldots, \frac{\partial u}{\partial x_N}\right) = \frac{\partial u}{\partial t}.$$

Different sufficient conditions are obtained for the existence of solutions for these problems. In the parabolic cases, the so-called "supplementary

[Continuation of JILIN DAXUE ZIRAN KEXUE XUEBAO No 1, 1980 pp 19-46]

function" methods are used to obtain the interior and boundary estimates of derivatives of solutions, for differential equations and approximating difference-differential equations. Furthermore, problems of periodic solutions without initial conditions, of continuous initial values and of domain with infinite time are studied.

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TITLE: "The Optical Model Analysis of Fast Neutron Scattering for $^{6,7}$Li"

SOURCE: Jilin JILIN DAXUE ZIRAN KEXUE XUEBAO [NATURAL SCIENCE JOURNAL OF JILIN UNIVERSITY] in Chinese No 1, 1980 pp 47-54

TEXT OF ENGLISH ABSTRACT: This paper has systematically analyzed the fast neutron scattering data for $^{6,7}$Li by means of the optical model method. The incidence energy is 4.83-15 MeV and 7-15 MeV for $^{6}$Li and $^{7}$Li respectively, and the data analyzed include total cross section, elastic cross section and angular distribution. The result obtained is in good agreement with the experimental data. The optical potential we use is of the Woods-Saxon type with surface absorption and spin-orbit coupling. We choose diffusion parameter of the real part and surface absorption depth as energy dependent parameters which vary with incidence energy linearly. All other parameters are independent of energy and, in addition, they are the same for $^{6}$Li and $^{7}$Li. We discovered that the diffusion parameter of the real part slowly decreases with the increasing of incidence energy.

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TITLE: "A New Effect of X-ray Diffuse Diffraction from Single Aluminum Crystals under Cold-Work"

SOURCE: Jilin JILIN DAXUE ZIRAN KEXUE XUEBAO [NATURAL SCIENCE JOURNAL OF JILIN UNIVERSITY] in Chinese No 1, 1980 pp 55-65

TEXT OF ENGLISH ABSTRACT: The diffuse diffractions of X-rays from single crystals of aluminum under mechanical extension are reexamined, and the change of the shapes of the surfaces of equal diffusion after extension surrounding some reciprocal-lattice points are analyzed diagrammatically. We conclude that it is really a new effect never observed by others before.

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TITLE: "The Potential Functions of Interatomic Interaction and the High-Pressure Equations of State for Zinc and β-Brass"

SOURCE: Jilin JILIN DAXUE ZIRAN KEXUE XUEBAO [NATURAL SCIENCE JOURNAL OF JILIN UNIVERSITY] in Chinese No 1, 1980 pp 69-79

TEXT OF ENGLISH ABSTRACT: In the present paper, the potential functions of interatomic interaction for zinc and perfect-ordered CuZn alloy are dealt with by using the experimental data of lattice parameter, sublimation and formation heat, and compressibility (or elastic constant). The four typical Gruneisen constants-volume relations and their high-pressure equations of state are calculated. The high-pressure equation of state for nearly perfect ordered β-brass has been discussed, with the ordered parameter introduced. The theoretical calculation of the high-pressure equation of state for zinc and the experimental results of the shock wave are found to be agreeable (the deviation is less than 6 percent near 500 kb).

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TITLE: "On the Theory of Chemical Bond in Transition-Metal Dinitrogen Complexes (II)"

SOURCE: Jilin JILIN DAXUE ZIRAN KEXUE XUEBAO [NATURAL SCIENCE JOURNAL OF JILIN UNIVERSITY] in Chinese No 1, 1980 pp 83-95

TEXT OF ENGLISH ABSTRACT: In this paper the stabilization energy, charge density on the nitrogen atoms, and bond order between the two nitrogen atoms of trinuclear transition-metal dinitrogen complexes, in which $N_2$ had been coordinated to the metals in different forms, are calculated and discussed by using the methods of HMO and graph theory. It is found that the varying tendencies of charge density on the N atoms in trinuclear dinitrogen complexes are similar to those in mononuclear and binuclear dinitrogen complexes. However, the varying tendencies of stabilization energy of trinuclear dinitrogen complexes are different from those of mononuclear and binuclear dinitrogen complexes. From the calculated results, it is deduced that coordinating activation of $N_2$ by nitrogenase may be the concerted effects of multinuclear cluster involving both end-on and side-on coordination.

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TITLE: "X-Ray Extinction in the Bragg Case"

SOURCE: Jilin JILIN DAXUE ZIRAN KEXUE XUEBAO [NATURAL SCIENCE JOURNAL OF JILIN UNIVERSITY] in Chinese No 1, 1980 pp 96-102

TEXT OF ENGLISH ABSTRACT: In this paper we have established the differential equations of dynamics (Zachariasen-type) in the asymmetrical Bragg case. Making use of Chen's integral table (1965) and Becher's primary extinction coefficient (1974), we obtained the solutions to the equations. Thus, Chen's results have been extended to the more general case where asymmetrical reflection, primary and secondary extinction occur simultaneously.

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TITLE: "On the Method of Analyzing the NMR Spectra in Liquid Crystal Solvents"

SOURCE: Jilin JILIN DAXUE ZIRAN KEXUE XUEBAO [NATURAL SCIENCE JOURNAL OF JILIN UNIVERSITY] in Chinese No 1, 1980 pp 103-124

TEXT OF ENGLISH ABSTRACT: In this paper, the topic on the method of analyzing the NMR spectra in liquid crystal solvents is briefly reviewed from a more unified point of view, although the major parts are mainly out of the treatise written by Emsley and Lindon as well as some other articles in this field. However our discussions are limited to those systems that can be solved exactly to give solutions with closed analytical forms. No attempt has been made to discuss the numerical methods by using computer simulation.

This review includes three parts: In part (1) we concentrate our attention on discussing the method of getting the general expressions of $AB_n$ and $AB_nX$ spin systems. Systems of $A_n$, AB, $AB_2$, $AB_3$, ABX, in Emsley's treatise are all the special cases of our general expressions. In part (2), AA'A"A"" system with

[Continuation of JILIN DAXUE ZIRAN KEXUE XUEBAO No 1, 1980 pp 103-124]

$C_{3v}$ symmetry is discussed in detail for illustration. In part (3) we deal with the spin systems having quadrupolar nuclei and then the expressions obtained in a unified fashion. Some mistakes occurring in the original reference books and papers are corrected as well.

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TITLE: "Theoretical Review of Guided Wave Optics"

SOURCE: Jilin JILIN DAXUE ZIRAN KEXUE XUEBAO [NATURAL SCIENCE JOURNAL OF JILIN UNIVERSITY] in Chinese No 1, 1980 pp 125-134

TEXT OF ENGLISH ABSTRACT: A theoretical review is given of the field of guided wave optics. The eigenmodes of slab dielectric waveguide are summarized, and on this basis coupled mode equations and their solutions of optical waveguide with perturbation are given. Topics treated here include coupling between guided mode and radiation modes, coupling between two guided modes, diffraction of guided mode, TE-TM mode conversion, and relative optical guided wave devices.

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TITLE: "On the Nature of Higher Order Functions and Operators"

SOURCE: Nanjing NANJING DAXUE XUEBAO [JOURNAL OF NANJING UNIVERSITY] in Chinese Natural Sciences Edition No 1, 1980 pp 1-10

TEXT OF ENGLISH ABSTRACT: In restricted predicate calculus we deal with functions, namely, the thing functions, which take individuals as values, and the propositional functions, i.e. predicates. Usually they take only individuals as arguments. Such a restriction seems, however, too severe. It would be better if we were to allow them to take propositions also as arguments. In addition, we also deal with operators, namely, quantifiers and descriptions. By the same reason, it would be better if we were to allow them to also take terms as their scopes and to take propositional variables as the directive variables. Further, in the extended predicate calculus, we also deal with functions of higher order and operators of higher order. We usually consider them to be quite different from each other.

In the present paper we show that: First, the functions of the second order

[Continuation of NANJING DAXUE XUEBAO Natural Sciences Edition No 1, 1980 pp 1-10]

are the same as the operators of the first order. For example, the expression $\varphi(A)$, where $\varphi$ is a function of the second order and A is a two-place first order function, may also be represented as $\Phi_{xy}A(x,y)$, where $\Phi_{xy}$ is an operator of the first order with two directive variables x and y. On the other hand, the expression $\lim_{x\to\alpha} f(x)$, where lim is an operator of the first order, may also be represented as $\lim(\alpha,f)$, where lim is now a function of the second order with one individual argument and one function argument (of first order). In general, the functions of order n+1 are the same as the operators of order n. (Nevertheless, see the following.)

Second, when we apply functions of the second order (i.e., operator of first order) to functions of the first order to form a term or a formula, it is not that the former (of higher order) take the latter (of lower order) as arguments (so asserted by the prevailing opinion), but that the former become arguments of the latter, or at least that the former bind the empty places of the latter. In any event, we cannot say that the latter are arguments of the former. Hence the usual expressions $A_{x\alpha}(x)$ and $\lim_{x\to\alpha} f(x)$ should be written as $\alpha A$ and $(f \lim \alpha$ or as $A\alpha(i)$ and $\lim a\, f(i)$. (We stipulate that if operators should be written after the scope they must be coupled with left parentheses.)

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Third, since the first order operators (i.e., functions of the second order) never take functions of the first order as arguments, there is no room to give rise to higher functions and operators. Hence we have only individuals, propositions, functions (of the first order) and operators (of the first order, i.e., functions of the second order). The extended predicate calculus would become much simpler.

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TITLE: "Nonlinear Differential Equations in Electron Beam Focusing Theory (II)"

SOURCE: Nanjing NANJING DAXUE XUEBAO [JOURNAL OF NANJING UNIVERSITY] in Chinese Natural Sciences Edition No 1, 1980 pp 11-18

TEXT OF ENGLISH ABSTRACT: As a continuation of a previous paper, we use in this note the series expansion (4) of the periodic solution $\bar{u}(x)$ of (1) and (2) to study its stability. Our results agree very well with the experimental results of Mendel, Quate and Yocom. That is to say, when $0<\alpha<0.4$ or $0.658<\alpha<1$, $\bar{u}(x)$ is stable, and when $0.4<\alpha<0.658$, $\bar{u}(x)$ is unstable.

We have already seen that there exists a close relation between geometrical properties of the curve $u = u^0(x_0, \alpha)$ (which we wrote simply as $u = u^0(x_0)$, denoting the locus of the first minimum and maximum points of solutions of (1) and (2)) on the one hand, and the existence and number of periodic solutions of (1) and (2) on the other hand. Now, by means of numerical calculation, we

[Continuation of NANJING DAXUE XUEBAO Natural Sciences Edition No 1, 1980 pp 11-18]

find furthermore that when $\alpha \doteq 0.4$, the shape of the curve undergoes a sudden change, i.e., when $\alpha$ increases and passes through the value 0.4, the curve $u = u^*(x_0, \alpha)$ changes from II to III. All these phenomena together with the stability properties described above deserve strict theoretical explanations.

Finally, we explain some known experimental results from the mathematical point of view, which is quite different from that of the engineers.

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TITLE: "Asymptotic Solution of Singular Perturbation Mixed Problems for the Second Order Quasi-linear Hyperbolic Partial Differential Equations"

SOURCE: Nanjing NANJING DAXUE XUEBAO [JOURNAL OF NANJING UNIVERSITY] in Chinese Natural Sciences Edition No 1, 1980 pp 19-30

TEXT OF ENGLISH ABSTRACT: In this paper we discuss mixed problems for the second order quasi-linear hyperbolic partial differential equations, which involve small parameters in the higher order derivatives. As $\varepsilon = 0$, the original equations are degenerated into the lower order differential equation, and a part of the boundary conditions is lost. The problems of this type are called singular perturbation problems. We constructed an asymptotic solution to the presented problem and investigated the asymptotic behavior of the solution.

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TITLE: "The Design of a 5 MeV Electron Linear Accelerator for the Industry"

SOURCE: Nanjing NANJING DAXUE XUEBAO [JOURNAL OF NANJING UNIVERSITY] in Chinese Natural Sciences Edition No 1, 1980 pp 31-45

TEXT OF ENGLISH ABSTRACT: We have designed a 5 MeV electron linear accelerator for industry. Its accelerating tube, which consists of the buncher and main light velocity section, has a constant hole radius of the disk. In this paper the methods and results of computation of the operating specifications, focusing magnetic field and electron gun design are described. Some of the data of the computation on the transverse motion which are useful for the design of the structure are also given.

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TITLE: "Radiocarbon Dating of Some Geophysical Samples in China"

SOURCE: Nanjing NANJING DAXUE XUEBAO [JOURNAL OF NANJING UNIVERSITY] in Chinese Natural Sciences Edition No 1, 1980 pp 47-52

TEXT OF ENGLISH ABSTRACT: Some samples from different geological origins and different geological ages are dated by means of $^{14}C$ using liquid scintillator method. The samples range from buried old wood in glacier deposits at 4200 and 3900 meters above sea level in Xizang (Tibet), the wood in a karst cave of Guizhou Province and charcoal in civilization layers in Liyang of Jiangsu Province, with geological ages ranging from 1000 to 7000 years ago.

The carbon is first converted into calcium carbide at 980°C, then it is hydrolyzed into acetylene and converted into benzene using silica-alumina catalyst. The catalyst was activated in chromic acid before using. The scintillator has

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36 g PPO + 0.6 g POPOP dissolved in 1 liter of Xylene. One mixes 1 ml of scintillator in each 5 ml of benzene.

The purity of benzene is controlled by ex-radioactive source channel compare method. The samples are contained in teflon bottles of 8 ml in capacity and are viewed by two photomultipliers in coincidence counting circuits.

The counting time for each sample is 1000 minutes for each run. The data are corrected with Damon's table.

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TITLE: "Investigations on A.C. Oscillographic Polarographic Titration. III. Titration of Zinc by EDTA and Ferrocyanide by Zinc"

SOURCE: Nanjing NANJING DAXUE XUEBAO [JOURNAL OF NANJING UNIVERSITY] in Chinese Natural Sciences Edition No 1, 1980 pp 53-60

TEXT OF ENGLISH ABSTRACT: In this paper, it has been shown that the AC oscillographic polarographic titration can be applied advantageously to titrate $Zn^{2+}$ by EDTA and ferrocyanide by $Zn^{2+}$. A thin film mercury electrode was used as the polarized electrode and Ag-coated Hg electrode as reference electrode. AC oscillographic polarographic titration was more rapid and accurate than the indicator methods. AC oscillographic titrations can be carried out in the presence of colored precipitates from ferric hydroxide and other reagents which interfere with the titration of indicator methods. Thus, zinc can be titrated in an ammonium solution in the presence of precipitates formed by sodium

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diethyldithiocarbamate and interfering ions such as $Fe^{3+}$, $Al^{3+}$, $Pb^{2+}$, $Cu^{2+}$ and $Mn^{4+}$. A rapid method is described for determination of Zn in minerals.

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TITLE: "The Synthesis of Labetalol"

SOURCE: Nanjing NANJING DAXUE XUEBAO [JOURNAL OF NANJING UNIVERSITY] in Chinese Natural Sciences Edition No 1, 1980 pp 61-64

TEXT OF ENGLISH ABSTRACT: The combined $\alpha$- and $\beta$-adrenoceptor blocking drug, Labetalol, is designed for the treatment of all grades of hypertension. It was prepared from methyl 5-bromoacetylsalicylate in three steps (total yield 22.4 percent) and from 5-chloroacetylsalicylamide in two steps (total yield 31.2 percent).

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TITLE: "The Physical Explanation of the Sun-Climate Relationship"

SOURCE: Nanjing NANJING DAXUE XUEBAO [JOURNAL OF NANJING UNIVERSITY] in Chinese Natural Sciences Edition No 1, 1980 pp 65-75

TEXT OF ENGLISH ABSTRACT: This paper has reviewed new advances in the investigations concerning the physical mechanisms of the sun-climate relationship. The main contents are: (1) the variation of the solar constant and its influence on climatic variation; (2) the sun-atmosphere energy coupling; (3) the solar activity and the atmospheric electricity. In addition, the research history and future progress of this subject are described briefly.

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TITLE: "Performance Evaluation of Computer Systems"

SOURCE: Nanjing NANJING DAXUE XUEBAO [JOURNAL OF NANJING UNIVERSITY] in Chinese Natural Sciences Edition No 1, 1980 pp 76-92

TEXT OF ENGLISH ABSTRACT: Because of the continuous developing of the complexity of computer architecture and computer applications, the performance evaluation of computer systems is rapidly developed and it has become one of the important research domains of computer science. It seems to us that the main objective in studying system performance evaluation is to enable us to design computer systems more efficiently and to enhance cost effectiveness and to facilitate various applications.

This paper summarizes developments in system performance evaluation, then describes in detail three major methods of evaluation: analysis, simulation and measurement as well as their applications by way of examples. Different viewpoints are presented by the authors of this paper.

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TITLE: "Studies on the Cyanophyta of China. III. Fossil Blue-Green Algae from the Dainan Formation (Lower Tertiary) of Northern Jiangsu"

SOURCE: Nanjing NANJING DAXUE XUEBAO [JOURNAL OF NANJING UNIVERSITY] in Chinese Natural Sciences Edition No 1, 1980 pp 93-96

TEXT OF ENGLISH ABSTRACT: In this paper three new species of fossil blue-green algae were reported. They are Arthrospira breviarticulata Chu et Tseng sp. nov., Lyngbya macrocephalina Chu et Tseng sp. nov., and Plectonema ectoderma Chu et Tseng sp. nov. All the species were discovered from the Dainan formation (Lower Tertiary) of northern Jiangsu Province. From these three fossil algae, which we consider as freshwater species, it is proved indirectly that sediments of the Dainan formation (Lower Tertiary) of northern Jiangsu were freshwater facies.

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TITLE: "The Study of Characteristics of an Old Caldera and Its Associated Subvolcanic Granitic Body"

SOURCE: Nanjing NANJING DAXUE XUEBAO [JOURNAL OF NANJING UNIVERSITY] in Chinese Natural Sciences Edition No 1, 1980 pp 97-120

TEXT OF ENGLISH ABSTRACT: This paper is a preliminary analysis of a late Jurassic caldera occurring in the vicinity of Zhongteng district. The caldera, being about 600 $km^2$ in area, is located at the intersection of two sets of fracture zones trending NE-SW and E-W respectively.

In the center of the caldera is a granitic stock covering an area of about 90 $km^2$. It possesses the features of a ring complex and is composed of

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quartz-monzonite-diorite, quartz-monzonite including monzonitic granite and fine-grained granite from the outer to the inner ring. According to the geological occurrence and the characteristics of petrochemistry and mineral composition, it is clearly shown that the ring complex was formed by comagmatic activity through three stages of intrusion.

The country rocks of the Zhongteng igneous body consist principally of volcanics, ranging in composition from intermediate to acidic with a total thickness of about 1620 m, in which a great number of welded tuffaceous rocks constitutes three cooling units amounting to 1440 m in thickness. These volcanic rock series are concentrically distributed and dip inwardly around the central stock. It is believed that the Zhongteng caldera was formed through collapse on a large scale following the strong eruption of volcanic ash flows. The depth of collapse in the central part is estimated to be about 500 m. In addition, there are four parasitic volcanoes and two occult explosive bodies arranged in a semicircular pattern around the Zhongteng body.

The Zhongteng body was placed beneath the earth's surface at about 300-1100 m. In summing up the results concerning the texture of rocks, the temperature measuring of inclusions, the triclinity of potash feldspars, the coefficient of

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oxidation and the widely developed columnar joints, it is suggested that the Zhongteng intrusive complex may be recognized as a typical subvolcanic body.

A number of petrochemical diagrams demonstrate that the volcano-intrusive complex in the Zhongteng area is characterized by the calc-alkaline rock series.

The writers are led to the conclusion that the rock series were virtually derived from the evolution of the andesitic magma which ascended from the top of the upper mantle along the fracture zones at the continental margin and remelted contemporaneously the continental crust to form abundant acidic melts. The successive eruption and intrusion activities evidently led to the Cu and Mo mineralization in the later phase of magmatic process.

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TITLE: "Quaternary Environmental Changes in Eastern China"

SOURCE: Nanjing NANJING DAXUE XUEBAO [JOURNAL OF NANJING UNIVERSITY] in Chinese Natural Sciences Edition No 1, 1980 pp 121-144

TEXT OF ENGLISH ABSTRACT: The climatic and environmental changes of eastern China may be summarized as follows:
(1) Plio-Pleistocene morphogenetic movements initiated glaciations in eastern China. Late Pliocene earth movements persisted strongly into the Pleistocene. Since the beginning of the Pleistocene period a new stage of earth history of China was set. The rise of the continent and the lowering of the sea level increased the albedo and the continentility. As the land relief became higher and higher Plio-Pleistocene conglomeratic deposits of "Molasse" type spread widely. The authors suggest that the conspicuous morphogenetic movement, chiefly great faulting movements in China, has fundamentally affected the pattern of global atmospheric circulation and led to the glacierization of different parts of China.
(2) There is a formidable amount of evidence from many different lines of

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research to show that during the glacial epoch the polar front and cyclone track shifted southward while the summer monsoon became much weaker. Late Pleistocene snowlines, lower limits of periglacial processes and boreal flora have depressed 1000-2000 meters. Between 30,000 years B.P. and 12,000 years B.P. the shift of the periglacial zone was about 1600 km and the periglacial environment dominated the eastern great plains and the adjoining mountainous regions north of 30°N.

The younger loess (Malan loess of north China and the upper Shiashu loess of the Nanjing area) were accumulated during the Tali (Würm-Wisconsin) glaciation. The "Basal gravels" might have accumulated during the Emm interglacial, representing an intervening erosion phase. As revealed by pollen analysis, paleosals developed during the interglacial or interstadial periods. There is clear evidence that throughout the Quaternary the climate became colder and drier. The Tali (late Würm) glaciation was the coldest and driest one. But the temperature of Lushan/Taku (Halsteim) interglacial was 4°C higher than it is now.
(3) A cold trough existed in eastern China during the Pleistocene ice age and the little ice age.

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The Pleistocene snowline descended from the western regions to the east coast. When it reached the Lower Changjiang Valley, it steepened conspicuously. Late Pleistocene Mammuthus-Coelodonta Fauna moved southward to 34°N, showing their greatest southward extension in the world. Boreal vegetations are distributed at 2000-4000 m above sea level today, but descended to 450 m in the Late Pleistocene epoch near the east coast of Zhejiang. Quaternary glaciations and periglacial features have been found in mountainous regions adjoining the Lower Changjiang Valley. Abundant facts recorded in Chinese historical writings provide us with excellent references in studying the much colder climate of eastern China during the little ice age. All the facts mentioned above show the much greater horizontal and vertical displacement of the climatic belts in eastern China.

The territory where the greatest southward displacement of climatic belts has taken place might be defined as the "cold trough" of eastern China. The "cold trough" was vulnerable to the effects of climatic changes. The causal mechanism of the "cold trough" is fully discussed in this paper.

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TITLE: "The Evapotranspiration and Supplementary Water Requirement of Paddy Fields in China"

SOURCE: Nanjing NANJING DAXUE XUEBAO [JOURNAL OF NANJING UNIVERSITY] in Chinese Natural Sciences Edition No 1, 1980 pp 145-159

TEXT OF ENGLISH ABSTRACT: In this paper, the evapotranspiration and supplementary water requirement of paddy fields for different cultivating periods in China are estimated from heat and water balance climatological methods. The results may be summarized as follows:
(1) The net radiation ($R_0$), evapotranspiration (E) and radiative dry index ($R_0/Lr$) of paddy fields for different cultivating periods in China are shown below:

| | $R_0$ (Kcal/cm$^2$) | E(mm) | $R_0/Lr$ |
|---|---|---|---|
| first cropping of rice in the double cropping rice system | 17.5~22.5 | 300~400 | 0.5~1.0 |

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| | | | |
|---|---|---|---|
| second cropping of rice in the double cropping rice system | 15~30 | 250~500 | 0.5~1.5 |
| single cropping of rice: | | | |
| 1. South cultivating region | 20~30 | 350~550 | 0.5~1.0 |
| 2. North cultivating region | 20~35 | 400~700 | 1.0~over 16 |
| late maturing variety of single cropping of rice | 27.5~42.5 | 450~700 | 0.5~1.5 |

(2) The critical radiative dry index $(R_0/Lr)_c$ needless of irrigation rapidly decreases with the increasing of percolation (P), and the slope of the correlative curve between $(R_0/Lr)_c$ and P gradually decreases with the increasing of $R_0$. In the present condition of rainfall utilization, irrigation is necessary everywhere and in every cultivating period according to $(R_0/Lr)_c$ of the paddy fields during the cultivating period.
(3) The supplementary water requirement (M) of paddy fields during the cultivating period increases with increasing of P and $R_0/Lr$, but it increases more rapidly if $R_0/Lr$ is below 1.0 than it does when $R_0/Lr$ is above 1.0.

[Continuation of NANJING DAXUE XUEBAO Natural Sciences Edition No 1, 1980 pp 145-159]

(4) The calculation shows that the ratio of the area of catchment to the area of paddy field ($A_c/A_f$) also increases rapidly with $R_0/Lr$ and P.

9717
CSO: 4009

AUTHOR: LI Yinting [2621 5593 0080]
GUAN Dexiang [7070 1795 4161]

ORG.: Both of the Institute of Mechanics, Chinese Academy of Sciences

TITLE: "Motion of Particles Suspended in Stationary Turbulent Medium at Large Reynolds Number"

SOURCE: Beijing KEXUE XUEBAO [SCIENCE BULLETIN] in English Vol 25 No 4, Apr 80

EXCERPTS FROM ENGLISH ABSTRACT: The problem of motion of particles suspended in a turbulent medium is of great significance in the study of laser velocity measuring techniques, atmospheric pollution, formation of clouds and rain, and deposition of mud and sand. The key to the problem lies in the "follow-up" behavior of suspended particles with the surrounding medium. There is a great need for laser measuring techniques to determine flow velocity in the turbulence field so as to find a statistical criterion for a complete "follow-up," because only under this condition can suspended particles serve as flow velocity indicators.

[Continuation of KEXUE XUEBAO Vol 25 No 4, Apr 80]

By the "follow-up" behavior of suspended particles we mean the degree to which the velocity of suspended particles depends on, or reflects, that of the flow field. By analyzing the "follow-up" behavior of particles suspended in a known turbulence field, we have succeeded in finding a statistical criterion for complete "follow-up" of suspended particles with the surrounding medium.

AUTHOR: WEI Keqin [5898 0344 0530]
LIN Ruifen [2651 3843 5358]
WANG Zhixiang [3769 1807 4382]
ZHOU Xiuyun [0719 4423 0061]

ORG: All of the Institute of Geochemistry, Chinese Academy of Sciences

TITLE: "Distribution of Tritium in Natural Water in China"

SOURCE: Beijing KEXUE XUEBAO [SCIENCE BULLETIN] in English Vol 25 No 4, Apr 80

TEXT OF ENGLISH ABSTRACT: Tritium is a cosmogenic radioactive isotope of hydrogen. It originates from interactions between cosmic rays and the constituents of the upper atmosphere. The dominant nuclear reactions are $^{14}N(n, {}^{3}H)^{12}C$ and $^{16}O(p, {}^{3}H)^{14}O$, etc. By $\beta^-$-decay, $^{3}H$, whose half-life is 12.26 years, may change into $^{3}He$, a stable isotope of helium. When water molecules containing $^{3}H$ mix with the ordinary molecules of natural water, they circulate together. Since the 1950's, thermonuclear tests have become another important source of $^{3}H$, so at present the majority of $^{3}H$ found in natural water comes from thermonuclear tests. As a subject of basic research, the scope of the study of the distribution of $^{3}H$ in natural water has now become so wide and important that it requires the coordinated efforts of scientists on an

[Continuation of KEXUE XUEBAO Vol 25 No 4, Apr 80]

international scale and has found practical applications in many fields. A large amount of data on $^{3}H$ has been accumulated in the world during the past 20 years, and the characteristics of its global distribution in natural water have been studied.

Fifty-six items of data on $^{3}H$ concentration in precipitation and surface water samples collected in China during May, 1978 are reported in this paper, and its geographical distribution based on these data is discussed.

AUTHOR: SHEN Zhutong [3088 0031 0681]
SUN Guoxian [1327 1613 7359]

ORG: Both of the Institute of Physics, Chinese Academy of Sciences

TITLE: "Some Investigations on Ultrahigh Pressure Sintering of Polycrystalline Diamond"

SOURCE: Beijing KEXUE XUEBAO [SCIENCE BULLETIN] in English Vol 25 No 5, May 80

TEXT OF ENGLISH ABSTRACT: Experiments have shown that under ultrahigh pressure additives can promote the activity of diamond sintering processes. Therefore, in order to study the mechanism of the formation of sintered diamond and some of its properties, it is important to investigate the forms and characteristics of the additives in it. In this paper research into the sintering of polycrystalline diamond under ultrahigh pressure with nickel as an additive is briefly reported.

AUTHOR: ZHANG Zexiang [1728 3419 3276]

ORG: Group 104, Institute of Physics, Chinese Academy of Sciences

TITLE: "Displacement of Plasma Column in CT6B Tokamak"

SOURCE: Beijing KEXUE XUEBAO [SCIENCE BULLETIN] in English Vol 25 No 5, May 80

TEXT OF ENGLISH ABSTRACT: The CT6B device is a modification of the CT6A device. Its parameters are the same as the previous one, except that the copper shell is removed and a new vacuum chamber is assembled. The chamber is made of 2 mm rigid stainless steel sections welded together, with a ceramic break and a molybdenum limiter. There is a set of windings (called V-coils) for producing a vertical magnetic field and another (called H-coils) for compensating horizontal stray fields. The plasma displacement is measured by the so-called saddle coils and cosine coils. We have found that this method is better than the Mirrov probe method, especially for a shell-less Tokamak.

AUTHOR: XU Jiquan [6079 0370 3123]
FANG Yesen [2455 6777 2773]
LI Liwen [2621 4539 2429]

ORG: XU of the Institute of Soil Science, Chinese Academy of Sciences; FANG of the Department of Geology, Nanjing University; LI of the Department of Geography, Nanjing Teachers' College

TITLE: "Discovery of the Attapulgite Clay in Liuhe County, Jiangsu Province"

SOURCE: Beijing KEXUE XUEBAO [SCIENCE BULLETIN] in English Vol 25 No 5, May 80

TEXT OF ENGLISH ABSTRACT: Attapulgite clay was discovered in 1976 by the authors of this report at Xiaopanshan and Baitushan hills in Liuhe County, Jiangsu Province. The clay possesses unique physicochemical properties which make it suitable for many uses, especially for oil drilling and decolorization of oil or grease, and great attention is being paid to it by the petroleum and chemical industry.

AUTHOR: GONG Zhiben [7895 4249 2609]

ORG: Anhui Institute of Optics and Fine Mechanics, Chinese Academy of Sciences

TITLE: "Effect of Transmission of Pulsed High-Power 10.6 $\mu$m Laser on Atmosphere"

SOURCE: Beijing KEXUE XUEBAO [SCIENCE BULLETIN] in English Vol 25 No 6, Jun 80

TEXT OF ENGLISH ABSTRACT: The presence of atmospheric kinetic cooling caused by atmospheric absorption of 10.6 $\mu$m laser radiation has been proved through theoretical analysis and experiments. Breig expanded the work done by Wood et al., and after considering the absorption saturation effect which was neglected by Wood et al., obtained an analytic expression for atmospheric temperature change caused by the atmospheric absorption of high-power $CO_2$ laser radiation. However, they assumed the specific heat capacity at constant pressure and volume respectively. Now some problems have been encountered in the process of laser beam transmission through the actual atmosphere. Under what conditions are the above assumptions to be made? Under what conditions can the absorption saturation effect be neglected? Can a much more general analytic expression of the atmospheric temperature change be derived? This paper is an attempt by the author to answer these questions.

AUTHOR: ZHANG Rubo [1728 1172 2672]
TIAN Huixin [3944 1920 2450]
PENG Zhizhong [1756 1807 1813]
MA Zhensheng [7456 0811 3932]
HAN Fengming [7281 7364 7686]
JING Zebei [2529 3419 5926]

ORG: ZHANG and TIAN both of Chengdu College of Geology; PENG and MA both of Wuhan College of Geology; HAN and JING both of Xinjiang Mining Bureau

TITLE: "A New Mineral--Ashanite $(Nb, Ta, U, Fe, Mn)_4O_8$"

SOURCE: Beijing KEXUE XUEBAO [SCIENCE BULLETIN] in English Vol 25 No 6, Jun 80

TEXT OF ENGLISH ABSTRACT: We found a new mineral in northwest China in August, 1977. It is a rich-niobium end member of the ixiolite series. This new mineral was named ashanite after the place where it was discovered, the Altai Mountains ("a" from Altai, "shan" meaning mountain or mountains in Chinese).

AUTHOR: KONG Fan'ao [1313 4907 2407]
YU Shuqin [0205 2579 0530]
HU Zhaolin [5170 3564 2651]
LIU Yushen [0491 3768 3747]

ORG: All of the Department of Chemicophysics, University of Science and Technology of China

TITLE: "Laser Isotopic Enrichment of $^{34}SF_6$ and the Preparation of $^{34}S$"

SOURCE: Beijing KEXUE XUEBAO [SCIENCE BULLETIN] in English Vol 25 No 7, Jul 80

TEXT OF ENGLISH ABSTRACT: Recently there have been many reports on experiments of laser isotopic enrichment of $SF_6$ with infrared multiphoton dissociation. The aim of all these experiments is the determination of the relative contents of $^{34}SF_6/^{32}SF_6$ in the residual gases by IR or mass spectra. The present paper is a report on what we have achieved along this line and our success in extracting S from enriched $SF_6$ through hydrolysis, separation, sodium reduction and iodine oxidation.

By using $H_2$ as a scavenger of laser-induced reactions, the products obtained were several low valent sulfur fluorides and HF. These products were converted

subsequently into $SOF_2$ and $SiF_4$ in glass containers in the presence of trace moisture. Our job in this is to separate the products induced by laser beams from enriched $SF_6$ and then to turn them into free sulfur.

Because $SOF_2$ and $SiF_4$ are easy to hydrolyze and the products of hydrolysis are acidic, we have made use of these properties by hydrolyzing the mixture of gases produced by irradiation and absorbing the new products with NaOH. The $SF_6$ in the mixture not hydrolyzed was reduced to $Na_2S$ with metallic sodium. $Na_2S$ was then oxidized by $I_2$ in a weak basic solution. Finally, by means of extracting with $CS_2$, pure sulfur powder was obtained.

AUTHORS: YANG Minzhi [2799 2404 0037]
LI Yongchun [2621 3057 2504]

ORG: Both of the Tianjin Geological Survey, Ministry of Metallurgical Industry

TITLE: "Uranothorite Discovered in Rare Earth, Niobium, Iron Deposits at Bayan Obo, Nei Monggol, China"

SOURCE: Beijing KEXUE XUEBAO [SCIENCE BULLETIN] in English Vol 25 No 7, Jul 80

TEXT OF ENGLISH ABSTRACT: While studying the constitution of the rare earth, niobium, iron ore at Bayan Obo, Nei Monggol, we discovered a mineral in sand-grain form. It is identified as uranothorite after mineral separation, determination of physical properties, X-ray diffraction with powder method, and electron microprobe analysis. Uranothorite is of the uranorite-thorite group of silicate minerals. It is the first discovery of this mineral in China.

9717
CSO: 4009

AUTHOR: SUN Haifang [1327 3189 5364]

ORG: None

TITLE: "Sea Oscillation"

SOURCE: Beijing HAIYANG [OCEANS] in Chinese No 2, Feb 80 pp 1-2

ABSTRACT: Using the experiences of 2 Japanese cargo ships sailing on the Pacific Ocean in Mar 33 and 17 Feb 59 , this paper describes free oscillation of sea water caused by earthquake or volcanic eruption of the coastal region or the ocean floor. The wave [tsunami] has a vertical vibration characteristic, measuring only several km, but having a fast speed of about 1,400 m /sec. In China, ocean oscillation was recorded on 13 Feb 18 when a 7.5 earthquake occurred on the ocean floor (117° EL and 23.5° NL) near Nanao of Guangdong. In recent years, mild oscillation also occurred in Bohai during the 7.4 earthquake in Bohai and again during the 7.8 earthquake in Tangshan. To date, there has been no record of destruction caused by ocean oscillation in China, however.

AUTHOR: MAO Fuping [3029 4395 1627]

ORG: None

TITLE: "Laser Communication on the Sea"

SOURCE: Beijing HAIYANG [OCEANS] in Chinese No 2, Feb 80 p 31

ABSTRACT: When a ship is sailing on the sea, there is a need of communicating with the land regularly. At present, radio wave is used for that purpose, but it is not very good in orientation, secrecy, or resistance to interference. Laser provides the condition to make a communication equipment better than radio. The paper includes drawings depicting the theory of laser communication on the sea and a laser communication equipment. The equipment is said to be like telescope, weighing only 10.4 kg. Under the condition of 10.6 km of visibility, communication with this equipment may reach 6 km.

AUTHOR: LIN Jianping [3651 1696 1627]

ORG: None

TITLE: "A Tragedy Caused by Mercury"

SOURCE: Beijing HAIYANG [OCEANS] in Chinese No 4, Apr 80 pp 10-11

ABSTRACT: This paper relates the events occurred in Minamata, Japan in 1950 leading to the discovery of the Minamata Disease, a syndrome caused by methyl mercury poison. The paper proceeds to explain that when mercury containing waste of industry, agricultural drugs, and pharmaceuticals enters the atmosphere, the soil, and the water, the ocean finally receives the mercury. At present, more than 10,000 tons of mercury enters the oceans every year. After mercury is settled on the ocean floor, it is released at a rate of 1 percent per year and under the action of microorganisms, it is converted into methyl mercury to form a secondary pollution of the sea water. Methyl mercury is even more poisonous than mercury. The most effective method of preventing Minamata Disease is to treat the liquid waste that contains mercury. There is also the microorganism method, but the paper does not elaborate on it.

AUTHOR: LIN Yujie [2651 5940 2638]

ORG: None

TITLE: "Report of a Visit to a Deep Submarine Carrier"

SOURCE: Beijing HAIYANG [OCEANS] in Chinese No 4, Apr 80 pp 21-22

ABSTRACT: This paper reports the author's trip to Dongfang Shipbuilding Plant to participate in the trial run of Bohai No 1 deep submarine carrier. He recalled what chief engineer Li Gong [7812 6300] told him a year previously "deep submarines are small and very maneuverable but cannot carry sufficient supplies; therefore, a carrier ship is urgently needed." Aside from a story-like report of the carrier's maiden voyage, the paper also includes a drawing depicting the major constituent parts of the carrier and an offhanded description of the communication system between the carrier and the deep submarine after the latter is launched into the ocean depth.

AUTHOR: LIN Jianping [2651 1696 1627]

ORG: None

TITLE: "Mercury--A Monster Feared by Marine Organisms"

SOURCE: Beijing HAIYANG [OCEANS] in Chinese No 5, May 80 pp 3-4

ABSTRACT: Mercury pollution of the ocean damages men mainly through eating contaminated seafood. This paper explains the way mercury in the sea enters the food chain. Like a monster, the mercury content of seawater seeps into the planktons, the fish and shellfish, the seabirds and sea animals and collects in the bodies of these organisms to reach a density several hundred times that of the sea water. If the methyl mercury content of the fish or seabird is transferred to a man, it will endanger his health or cause Minamata Disease. Most countries set limits of mercury content of fish or shellfish being sold on the markets. They are 0.5 mg/kg in USA and Canada and 1 mg/kg in Japan and Sweden.

AUTHOR: ZHENG Jinshu [6774 6855 2885]

ORG: None

TITLE: "Using Poison to Attack Poison for Pollution Control--Antidote Phenomenon"

SOURCE: Beijing HAIYANG [OCEANS] in Chinese No 5, May 80 p 5

ABSTRACT: In a certain place of Southwest China, there is a plant using mercury as the raw material. Under the sunlight, pearl-like quicksilver may be seen on the roads near the plant. This is, without doubt, a region of mercury pollution. The inhabitants are happy and healthy, and no one is suffering from Minamata Disease, however. Research disclosed the fact that the mercury content of the hair of local residents reaches 5-10 mg/kg and that of the workers of the plant is 10 mg/kg. The soil and the water of the region contain higher than normal selenium, which interferes with the physiological action of mercury in the organic body. When 10 mg/kg of mercury was fed to experimental mice, all died, but when 0.5 mg/kg of selenium was added to the same dose of mercury, not a single mouse was poisoned. The paper also mentions other antidote relationships, including gold and copper, calcium and lead, lithum and sodium, etc.

AUTHOR: TANG Zhiba [0781 1807 2149]

ORG: None

TITLE: "Hunters on the Sea"

SOURCE: Beijing HAIYANG [OCEANS] in Chinese No 5, May 80 pp 6-7

ABSTRACT: Submarine hunters are a kind of small, near sea antisubmarine equipment. One of these weighs only 100-800 tons and can do 18-30 knots. It is easily operational in a storm and can sail continuously 1000-3500 nautical miles without stopping. It uses sonar as its eyes to look for submarines. Its legs are usually a high speed diesel engine. Its fist, i.e. its antisubmarine weapon includes antisubmarine guided missile, antisubmarine helicopter, torpedoes, rockets, etc. There is no mention in the paper of names of the countries that own these boats.

AUTHOR: WU Zhankuo [6762 1455 7059]

ORG: None

TITLE: "What Hit Shanfeng to Cause the Explosion?"

SOURCE: Beijing HAIYANG [OCEANS] in Chinese No 6, Jun 80 pp 1-2

ABSTRACT: On 1 Jul 78, at noon, when the 13,000 ton dredge, Shanfeng, was about to finish its work at sea just outside of the estuary of the Yangzi, there suddenly was an undersea explosion. The dredge was damaged, but no one was hurt badly. It was suspected that the suction rod of the dredge may have hit an underwater mine. Many of these were known to have been laid in the region of the sea by Japan, the USA, and the Kuomintang during WWII and just before the liberation. A Japanese ship was sunk in Jul 44 and a Chinese ship in 1948 by these leftover mines. In 1950, mine sweepers uncovered 7, but they all appeared to be too corroded to be operative, but one MK-26 picked up in 1965 appeared to be undamaged. In view of the fact that the shell fragments on the deck of Shanfeng are 2mm in thickness and having shining inner wall, it is believed that the culprit must be a MK-26. Obviously, many of the 600-700 mines laid by the USA in various points of the Yangzi must still be operative.

AUTHOR: LI Jinglong [2621 2529 7893]

ORG: None

TITLE: "On Underwater Welding"

SOURCE: Beijing HAIYANG [OCEANS] in Chinese No 6, Jun 80 pp 4-5

ABSTRACT: Underwater welding is needed for emergency repair of ships, salvaging, bridge construction, building large oil drilling platforms, laying underwater pipes, etc. Difficulties of underwater welding include darkness, pressure, and fast cooling speed, etc. There are now 3 types of underwater welding techniques. The most primitive is the wet method, which is safe and inexpensive, but air bubbles may easily occur to cause it unsuitable for welding important structures. The second is the local dry method, using inert gas in a cover. The humidity often causes the cover to be too cloudy for the welder to see. The third is the dry method, using a sealed and pressurized chamber, with all of the water in the chamber pumped out. With this method welding is possible in a depth of 100-300 m, with the quality almost as good as on land. The cost is very great, however. One such chamber in Japan has a price tag of 10 billion.

6168
CSO: 4009

AUTHOR: LI Zhizhang [2621 1807 4545]
XIAO Yiyong [5135 1355 7167]
LOU Fenli [2869 5358 7787]
JIANG Erdong [5592 1422 2639]
YANG Youzhi [2799 0645 1807]

ORG: None

TITLE: "Gas Tuftriding with Water-containing Urea (A Study to Improve the Working Life of Cold-forging Hex Nut Die)"

SOURCE: Hangzhou ZHEJIANG DAXUE XUEBAO [JOURNAL OF ZHEJIANG UNIVERSITY] in Chinese No 1, Mar 80 pp 1-12

TEXT OF ENGLISH ABSTRACT: From working and failure conditions of the cold-forging hex nut die, a study using water-containing urea to tuftride the die to improve its working life is made. It shows that the life of $Cr_{12}MoV$ dies is improved from 60,000~80,000 nuts per die of ordinary treated but non-tuftrided to 330,000~485,000 nuts per tuftrided. This is discussed qualitatively on the basis of optical-, electron-microscopic and ion-probe analyses. Due to the existence of compounds of carbon, nitrogen and oxygen in surface layers formed

[Continuation of ZHEJIANG DAXUE XUEBAO No 1, Mar 80 pp 1-12]

in the process of water-containing urea tuftriding, the hardness and toughness of the dies are increased, the coefficient of friction is decreased, the formation and expansion rate of "indentation" on the working surfaces of the dies are reduced, and hence the working life of the dies is prolonged.

AUTHOR: MAO Zhiyuan [3029 1807 6678]
HUANG Lanzhen [7806 5695 3791]
WANG Yuejun [3769 2588 0689]
WANG Fupei [3769 3940 1014]

ORG: None

TITLE: "Thin Depth Gas Carbonitriding for Ferrule of Bite Fitting"

SOURCE: Hangzhou ZHEJIANG DAXUE XUEBAO [JOURNAL OF ZHEJIANG UNIVERSITY] in Chinese No 1, Mar 80 pp 13-23

TEXT OF ENGLISH ABSTRACT: This paper discusses the thin depth (0.03-0.05 mm) gas carbonitriding process for a thin wall of ferrule, in which friethanalamine liquid drops were fed into a reformed shaft furnace. The ferrules were carbonitrided at 800°C for five minutes whith was followed by oil quenching. After tempering at 180°C for one hour, the surface hardness thus obtained was approximately Hv 800. Since the carbonitriding temperature is relatively low, the distortion of the ferrule is very small with the change in diameter of the ferrule less than 0.03 mm. After treatment, the ferrule is very tough with more austenite on its surface and less martensite in its core.

AUTHOR: None

ORG: Separate Engineering Research Group, Department of Chemical Engineering

TITLE: "The Determination of Solubility for Carbon Monoxide in Absorbent of Cuprous Aluminum Tetrachloride-toluene"

SOURCE: Hangzhou ZHEJIANG DAXUE XUEBAO [JOURNAL OF ZHEJIANG UNIVERSITY] in Chinese No 1, Mar 80 pp 24-37

TEXT OF ENGLISH ABSTRACT: The solubility for carbon monoxide in composition of absorbent was determined by a flowing-deabsorbing method at a temperature of 20-50°C and at the partial pressure of the carbon monoxide at 0.05-1 atm. The relations between solubility of carbon monoxide and pressure, temperature and compositions of the absorbent are obtained by the following expression:

$$V_{co} = \frac{[(109.0-1.44^{t})^{P} + 1.274^{t} - 96.29][1 + 0.624^{\exp(\frac{3710}{273+t} - 12.03)}]P_{co}}{0.624[1 + P_{co} \exp(\frac{3710}{273+t} - 12.03)]}$$

The maximum deviation of the evaluated value is within the range of 3.35 percent and the average error is within the range of 1.89 percent.

AUTHOR: XU Dingrong [6079 0002 2837]
QIAN Xiangdong [6929 0686 2639]
QIU Derang [5941 1795 6245]
LU Qiongyan [0712 8825 1280]

ORG: None

TITLE: "Extraction Spectrophotometric Determination of Gallium in Stone Coal"

SOURCE: Hangzhou ZHEJIANG DAXUE XUEBAO [JOURNAL OF ZHEJIANG UNIVERSITY] in Chinese No 1, Mar 80 pp 38-47

TEXT OF ENGLISH ABSTRACT: To meet the need of analysis of gallium in stone coal abundant in our province, the improvement of the extraction spectrophotometric determination of gallium with Rhodamine B was investigated. The proposed method utilizes a small amount of sample and it is fused with the alkali directly (without the demand of ignition to remove carbon). Moisten the melt with hydrochloric acid and evaporate the solution to dryness. Transfer the residue into a colorimetric tube with hydrochloric acid (5.0-5.5 N). Add the titanium trichloride and Rhodamine B respectively and extract it into a mixed solvent (benzene and ether). Then the absorbence is measured. This method is relatively easy, rapid and sensitive and is applicable to the determination of 0.5~50 PPM gallium. For a sample containing 0.001 percent gallium the relative error is ±10 percent.

AUTHOR: None

ORG: The Ev Tester Research Group, Department of Optical Instruments

TITLE: "The Ev Tester for the Automatic Exposure Control Camera"

SOURCE: Hangzhou ZHEJIANG DAXUE XUEBAO [JOURNAL OF ZHEJIANG UNIVERSITY] in Chinese No 1, Mar 80 pp 48-56

TEXT OF ENGLISH ABSTRACT: Some designing problems and methods concerning the Ev (exposure value) tester for automatic exposure control camera are discussed, and the principle and essential elements of the photo-electronic type which is used in the present design are detailed. Based on the analysis of foreign-made automatic cameras and photo-electronic type exposure meters, the research groups investigated and calculated the light source of this tester. Finally, the calibrated results are given.

AUTHOR: LI Yajun [2621 0068 0689]

ORG: None

TITLE: "A Graphical Method to Solve the Eigenvalue Equations of the Thin-film Optical Waveguide"

SOURCE: Hangzhou ZHEJIANG DAXUE XUEBAO [JOURNAL OF ZHEJIANG UNIVERSITY] in Chinese No 1, Mar 80 pp 57-64

TEXT OF ENGLISH ABSTRACT: In this paper, a graphical method to solve the eigenvalue equations of the thin-film optical waveguide is proposed. This method can be applied to the thin-film optical waveguide of arbitrary parameters.

The eigenvalue equation of the TE mode of one-dimensional waveguide stands; it is a transcendental equation and for its solution the author introduces two dimensionless parameters, $\xi$ and $\eta$. The equation is then transformed into a system of two equations. The former is a set of straight lines and the latter is a family of curves. The point of intersection of straight and curved lines gives the solution to the eigenvalue equation.

To the designers of integrated optical circuits it is important to know the

[Continuation of ZHEJIANG DAXUE XUEBAO No 1, Mar 80 pp 57-64]

dispersive character of the waveguide. Hence the solution between the effective index of refraction and the dimensionless parameter of the waveguide is derived. This relationship is represented by a circle in the Cartesian coordinates. Through the geometrical relation furnished by this circle, it is very easy to describe the characteristic curves of dispersion of the waveguide. The process of drawing the dispersive curve is shown. Also shown is the TE mode dispersive characteristics derived from the graphical method in this paper.

The eigenvalue equation of the TM mode of one-dimensional thin-film optical waveguide can also be solved by the method similar to that of the TE mode. The results are also given in this paper.

In conclusion, the graphical method shows itself as a useful auxiliary means of interpreting the thin-film optical waveguide. Through the analysis of the geometrical relation, the author has also obtained the explicit solution of the cut-off wavelength of the TE and TM modes as shown.

AUTHOR: ZHENG Zongrong [6774 1073 2837]
XIN Xuegeng [6580 1331 5087]
BAO Guangxiang [0545 0342 4382]

ORG: None

TITLE: "The Time Mark Generator of Solid Luminescent Diode"

SOURCE: Hangzhou ZHEJIANG DAXUE XUEBAO [JOURNAL OF ZHEJIANG UNIVERSITY] in Chinese No 1, Mar 80 pp 65-70

TEXT OF ENGLISH ABSTRACT: An integrated design of a time mark generator with high precision, high stability and high frequency was suggested. Obtained from the quartz crystal oscillator through the dividing network system as a driving source, the use of the GaAsP solid luminescent diode as the pulse light source and the use of the signal have advantages over other methods (mechanical, neon light tubes, discharge sparkling, etc.). These advantages are: lighter in weight, smaller in size, better in anti-seismicity and less driving power. Because the luminescence wavelength coincides well with the wavelength peak of the film sensitivization curve, the time mark frequency is very high (to 30 kc/sec) and more stable. This generator is designed especially for the slit mode high-speed camera, and it can also be used for other synchro-cameras.

AUTHOR: XU Xing [6079 5281]

ORG: None

TITLE: "Calculating the Critical Speed of a Rotating Shaft by the Finite Element Method"

SOURCE: Hangzhou ZHEJIANG DAXUE XUEBAO [JOURNAL OF ZHEJIANG UNIVERSITY] in Chinese No 1, Mar 80 pp 71-82

TEXT OF ENGLISH ABSTRACT: A calculation of the critical speed of a rotating disk and shaft system is obtained by FEM. The portions of disk and shaft of variable sections are described approximately by conical portions respectively. The displacement in the element is interpolated by a three-order polynomial function. In the calculation, the gyroscopic moment of the disk and shaft is taken into consideration. As for the vanes (straight and torsional), a suitable simplification is made. The influences of shaft shear and the oil film rigidity of the bearing are neglected, and the bearing surface is considered rigid.

This paper discusses a suitable method by which to calculate the critical speed of complex and multi-span rotating shafts. The computer program input

[Continuation of ZHEJIANG DAXUE XUEBAO No 1, Mar 80 pp 71-82]

requires only the information of constants of the material properties, the dimensions of elements, the number of elements and nodal points. Therefore, it is convenient to use. This method enables us to calculate the lowest critical speeds and modes.

AUTHOR: MAO Xinqiang [3029 0207 1730]

ORG: None

TITLE: "OTF and Revolution of the Rotating-Mirror Camera Framing at High Speed"

SOURCE: Hangzhou ZHEJIANG DAXUE XUEBAO [JOURNAL OF ZHEJIANG UNIVERSITY] in Chinese No 1, Mar 80 pp 83-92

TEXT OF ENGLISH ABSTRACT: This paper discusses how the optical transfer function (OTF) of the rotating-mirror camera framing at high speed, scanning with a diamond or rectangular-shaped aperture, has been computed for out-of-focus images. The results are analyzed and compared, and taking the transfer function into consideration, the revolution of the camera which contains film is briefly discussed.

AUTHOR: GUAN Neiming [7070 0155 2494]

ORG: None

TITLE: "Calculation of the Capacity of Rectifier Transformer in I-connection"

SOURCE: Hangzhou ZHEJIANG DAXUE XUEBAO [JOURNAL OF ZHEJIANG UNIVERSITY] in Chinese No 1, Mar 80 pp 93-112

TEXT OF ENGLISH ABSTRACT: This article deals with the principle of operating I-connected transformers, and also presents the derivation of the formulae for calculating the capacity of these transformers especially designed for rectifier operation, assuming that the rectifier circuit is in ideal operating condition. It concludes with the corrections made on the formulae for calculating the no-load average voltage $U_{do}$ taking into consideration the factors which have hitherto been neglected.

AUTHOR: CHEN Daoqi [7115 6670 3823]

ORG: None

TITLE: "On Opial Inequality"

SOURCE: Hangzhou ZHEJIANG DAXUE XUEBAO [JOURNAL OF ZHEJIANG UNIVERSITY] in Chinese No 1, Mar 80 pp 120-124

TEXT OF ENGLISH ABSTRACT: HUA Luogeng [5478 5012 1649] has proved the generalized Opial inequality:

$$\int_0^a |y(x)|^\ell \cdot |y'(x)|\,dx \leq \frac{a^\ell}{1+\ell} \int_0^a |y'(x)|^{1+\ell}\,dx,$$

where $y(x)$ is an absolutely continuous function on $(o,a)$, $y(o) = o$ and $\ell$ is a positive integer.

Hua conjectured that the above inequality might hold for all positive real numbers $\ell$. We have proved this conjecture is true.

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AUTHOR: LU Hua [6424 2901]

ORG: None

TITLE: "The Huangpu New Harbor Under Construction"

SOURCE: Beijing KEXUE SHIYAN [SCIENTIFIC EXPERIMENT] in Chinese No 4, Apr 80 pp 1-2

ABSTRACT: The Huangpu New Harbor is a new construction project of the Huangpu Harbor Affairs Management Bureau of the Ministry of Transportion. Premier ZHOU proposed in 1973 that the appearance of China's harbors must change within 3 years, and the Command Department of Huangpu New Harbor Construction was established the same year with almost immediate ground breaking. The first stage of the project was completed in the end of 1975. Now, on the eastern shore of the Pearl River estuary, the harbor has 5 booths for mooring ships of the 20,000 ton class and additional mooring spaces measuring more than 1,000 m in length. In addition, there are one wharf for oil tankers only, a railway station, and a 14 plus km of special rail line. Grain elevators of a capacity of 300,000 tons and more than 70 loading equipment of all sizes are now all operational. The second stage currently under construction will include 2 container docks measuring 470 x 380 m each. A photo of the grain elevators and another of the second stage engineering project are included in the description.

AUTHOR: YANG Baogen [2799 1405 2704]

ORG: None

TITLE: "Nuclear Electromagnetic Pulse Effect--A Strange Occurrence in Hawaii"

SOURCE: Beijing KEXUE SHIYAN [SCIENTIFIC EXPERIMENT] in Chinese No 4, Apr 80 pp 38-40, 33

ABSTRACT: On 9 Jul 62, the lighting transformer on the island of Oahu in Hawaii was suddenly burnt up by a surge of power of unknown origin to cause the lights of 30 streets on the island to be out of commission, and at the same time, several hundred burglar alarms on the island of Honolulu all suddenly went off while the circuit breakers all flipped like a corn popper. Following investigation, it was known that these events were caused by a high atmosphere nuclear explosion test conducted by the USA government in the Johnston Island of the Pacific Ocean. This nuclear explosion, 400 km above the ground surface of an equivalent of 1,400,000 tons of TNT caused damage to electrical installations on the ground surface and the solar batteries and electronic instruments on several orbiting artificial satellites to be prematurely out of commission. Previously, in 1960, a high altitude nuclear explosion in the USSR had caused radar and long distance communication systems to be not operational for as long as 24 hours. This paper describes the incident in Hawaii and the theory and the aftereffects of such events.

AUTHOR: ZENG Xinruo [2582 6580 5387]

ORG: Research Institute of Sonics, Chinese Academy of Sciences

TITLE: "Ultrasonic Microscope"

SOURCE: Beijing KEXUE SHIYAN [SCIENTIFIC EXPERIMENT] in Chinese No 5, May 80 pp 3-4

ABSTRACT: Optical microscopes can be used to observe light permeable objects or the surface of opaque objects. Electron microscopes can also be used to observe translucent objects while scanning electron microscopes can only be used to observe the surface of opaque objects. For the purpose of searching for a new technique of a capability of observing the internal structure of opaque objects, the ultrasonic microscope was born. Ultrasound has good penetration ability and has long been used to test internal defects of metal parts or concrete members. In medicine, it has been used to detect disorders of internal organs. But, in these applications, the millimeter ultrasonic wave is used. The newly created ultrasonic microscope uses micromillimeter wave and the length of the sonic wave in the most advanced ultrasonic microscope may reach 0.5 μm or shorter, with a differentiation comparable with optical microscopes. This paper explains the work principle and the application prospects of ultrasonic microscopes.

AUTHOR: YANG Baogen [2799 1405 2704]

ORG: None

TITLE: "A Strange Rock in the Forest"

SOURCE: Beijing KEXUE SHIYAN [SCIENTIFIC EXPERIMENT] in Chinese No 5, May 80 pp 5-7

ABSTRACT: This paper starts with a fictional telephone report of a patrolman to his commanding officer about his discovery of a strange rock in the jungle. Two horns grew out of the rock right under his eyes. He was told to bring the rock to the headquarters. When it arrived, the horns had retreated and it looked just like an ordinary rock, but after a little while, a pair of horns gradually extended from the rock and stayed out for 5 minutes. Inside the rock, it was discovered, there was a tape recorder and analysis of the tape revealed that all conversations, movements of tanks, etc. in the vicinity of the rock in the jungle had been recorded onto the tape. The rock is in fact an automatic detective station gathering intelligence by itself. In 1973, the paper claims, the USA had dropped from the air many such automatic intelligence devices disguised as rocks, briks, or stumps of rotten wood to gather and transmit intelligence data from behind the enemy lines in Vietnam. Process of dropping such devices, data gathering, and data transmission and reception are briefly described.

AUTHOR: CHEN Hongxun [7115 1347 8113]

ORG: None

TITLE: "Transportation Vehicles in a Tube"

SOURCE: Beijing KEXUE SHIYAN [SCIENTIFIC EXPERIMENT] in Chinese No 5, May 80 pp 18-19

ABSTRACT: In the early 1970's, the USA and Japan cooperated in an experiment to construct a pneumatic tube to transport merchandise containers. This type of tube transportation system requires a high initial investment. In the designing process, considerations must be given to preventing obstructions from occuring midway in the tube and to the method of retrieving the container if any accident should occur. Following prolonged experimentation, the tube is now operational [The paper does not mention the location of the experiment,] Most recently, the New Japan Iron and Steel Company constructed a tube line to deliver lime in containers at its second steel mill. The line has a capacity of 20,000 tons per month, operating 500 hours. The tube measures 609.6 mm in diameter and 1.5 km in length. A train of 2 containers carrying 500 kg is dispatched every 45 sec, to reach its destination in 6-8 sec. There is one air compressor and 12 auxiliary compressors to provide the air pressure. The paper suggests that the research and application of this technology may contribute to China's modernization.

AUTHOR: ZHANG Yongnian [1728 3057 1628]

ORG: None

TITLE: "Further Discussion on the Science of Chimneys"

SOURCE: Beijing KEXUE SHIYAN [SCIENTIFIC EXPERIMENT] in Chinese No 5, May 80 pp 31-36

ABSTRACT: After the paper, "The Science of Chimneys" was published in the journal, the editorial department has received many letters from readers asking questions on matters concerning chimneys that were not touched or not sufficient explained in that paper. This paper attempts to answer these questions. The questions include the cause of leaks in chimneys, the reason for a chimney to leak sometimes and not leak at other times, the method and structure of dust trapping devices installed in the chimney, and the structure and method of installing automatic valve to guarantee an upward draft.

AUTHOR: HAN Daxing [7281 1129 2502]

ORG: None

TITLE: "For Controlled Growth of a Single Aton Layer--Successful Research and Manufacture of China's First Molecular Beam Epitaxy [MBE]"

SOURCE: Beijing KEXUE SHIYAN [SCIENTIFIC EXPERIMENT] in Chinese No 6, Jun 80 pp 1-2

ABSTRACT: In the past decade, MBE technology has grown into a very active field, and commercial equipment is being sold by the USA, England, and France. Chinese scientists began research and designing in 1974, and the first MBE equipment made in China has been successfully completed in 1979. This paper explains the technology briefly, including its advantages over gaseous epitaxy. The importance of epitaxy in manufacturing semiconductors forms the first section of the paper.The paper also includes a drawing of the super-vacuum portion of the MBE equipment, and another drawing [not a photo] of the MBE equipment made in China. But, there is no mention of the organization that succeeded in making the first MBE equipment, nor the names of scientists who participated in the project.

AUTHOR: HAN Jie [7281 0512]

ORG: None

TITLE: "What is an Aspphyxiation Bomb? Introducing the Fuel Air Bomb"

SOURCE: Beijing KEXUE SHIYAN [SCIENTIFIC EXPERIMENT] in Chinese No 6, Jun 80 pp 22-23

ABSTRACT: As a matter of fact, the paper says, the USA has long been studying a weapon called the "fuel air bomb." Since 1967, it has been repeatedly used on battlefields. Aside from TNT, etc. there are many other combustible materials, such as easily inflammable solid powdery dust of aluminum, coal, etc. when it is suspended in the air, it will cause explosion when the condition is suitable. The fact that a mixture of certain inflammable gas and air in a given ratio will explode has been known long time ago from experience of coal and oil mining accidents. This is the theory behind the fuel air explosive (FAE) which began to appear in the 1960's. This paper discusses the method of making such bombs and their advantages and shortcomings.

AUTHOR: LIU Shaoqiu [0491 4801 3808]

ORG: None

TITLE: "Intercontinental Ballistic Missile"

SOURCE: Beijing KEXUE SHIYAN [SCIENTIFIC EXPERIMENT] in Chinese No 7, Jul 80 pp 37-39

ABSTRACT: Intercontinental ballistic missiles began to be developed after the WWII on the basis of the V-2 rockets of Germany. By 1978, the USSR had 1,400 intercontinental ballistic missiles with 4500 of these having nuclear warheads; the USA has 1054, with 11,000 nuclear warheads [?]. To date, intercontinental ballistic missiles may be divided into 4 generations. The history of development of intercontinental ballistic missiles is briefly told. The fact that a minute miscalculation at the launching site may cause a thousand mile mistake from the target is discussed. The paper begins with an explanation of intercontinental ballistic missiles, their trajectory, the passive segment of the flight, the altitude of the flight, the reentry, the maximum speed, etc.

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